CHONGYANG REN

MSAUD 2022-2023 **SELECTED WORKS**

GRADUATE SCHOOL OF ARCHITECTURE, PLANNING, PRESERVATION

CONTENTS

01. 2023 SPRING-STUDIO III

Strategies for Developing Productive Waterscapes and Inclusive Communities in Bogotá

Bogotá, COLOMBIA
Juan Amarillo

TEAM

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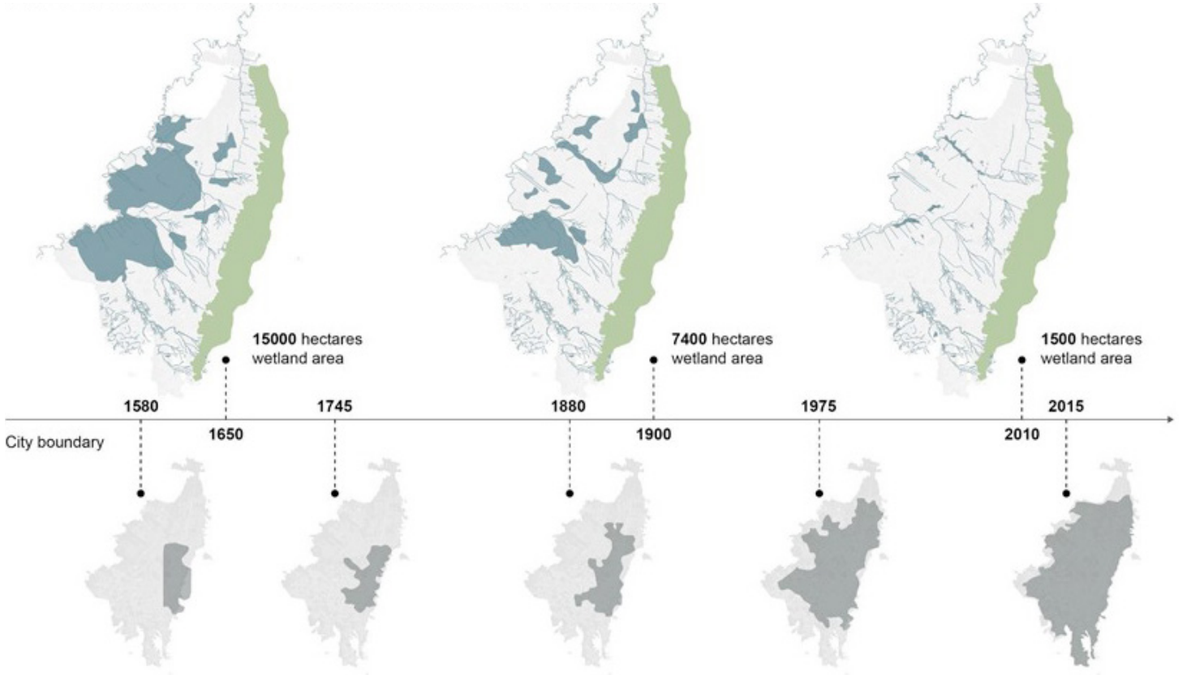
INSTRUCTORS

Kate Orff | Thaddeus Pawlowski
Dilip da Cunha | Geeta Mehta | Adriana Chavez

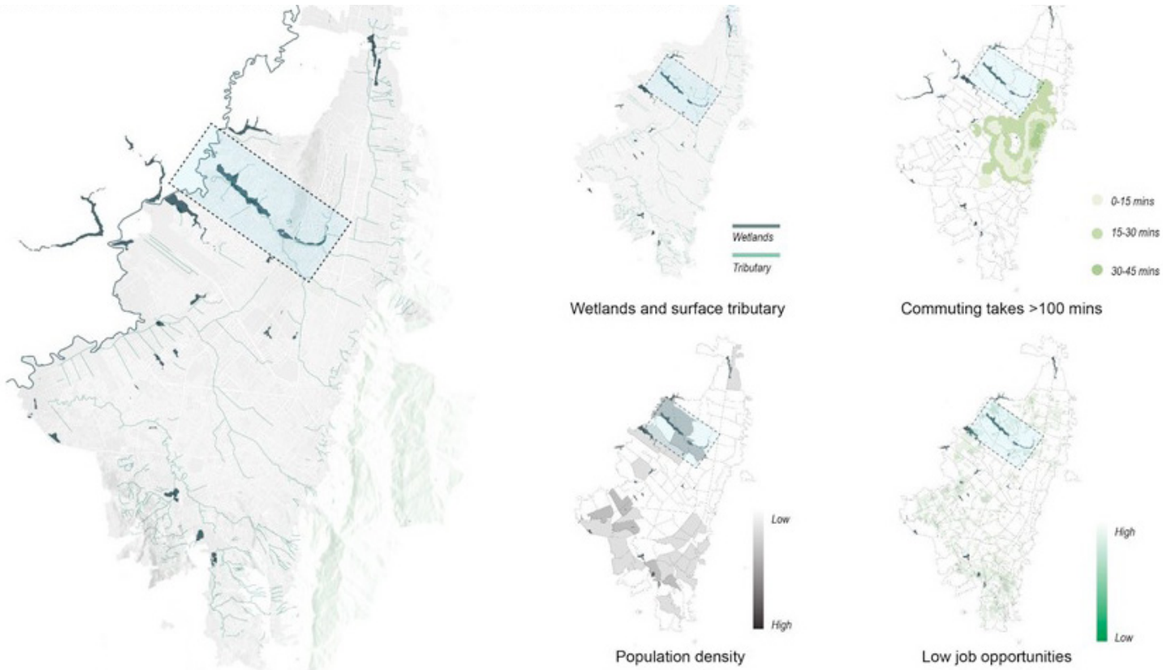
KEY STATEMENT

The edge of the Juan Amarillo Wetland and other wetlands of Bogota is not a static landscape. Rather it is a dynamic and productive place between wetland and community. Our project enhances this dynamic and productive edge, allowing residents to become the guardians of the wetland, protecting it through interaction and care in ways that work better than the fence that currently separates them. At the same time this edge can be cultivated for agricultural produce to enhance the community's economy. This reciprocity is an innovative working solution that generates benefits for both the wetland ecosystem and community.

SHRINKING WETLAND WITH URBAN SPRAWL



UNDERDEVELOPED WETLAND SURROUNDING AREA



SITE OBSERVATION NORTH SIDE

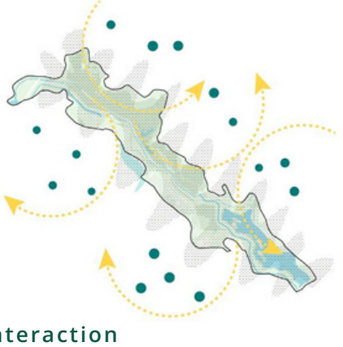
SITE OBSERVATION SOUTH SIDE

DESIGN CONCEPT

Current Wetland≠
Static landscape Features

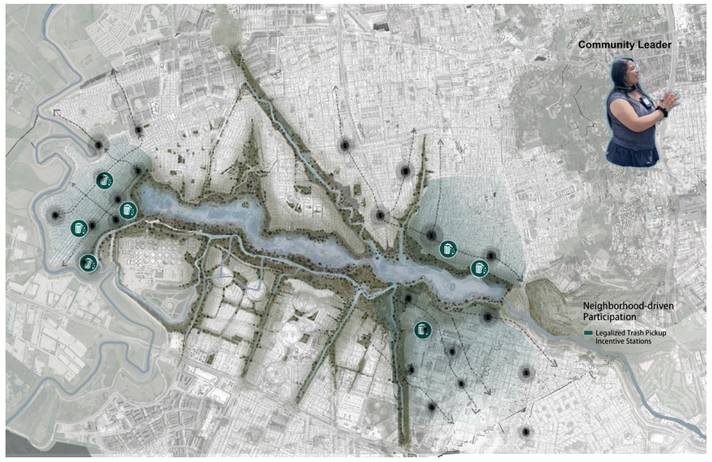
Weaving

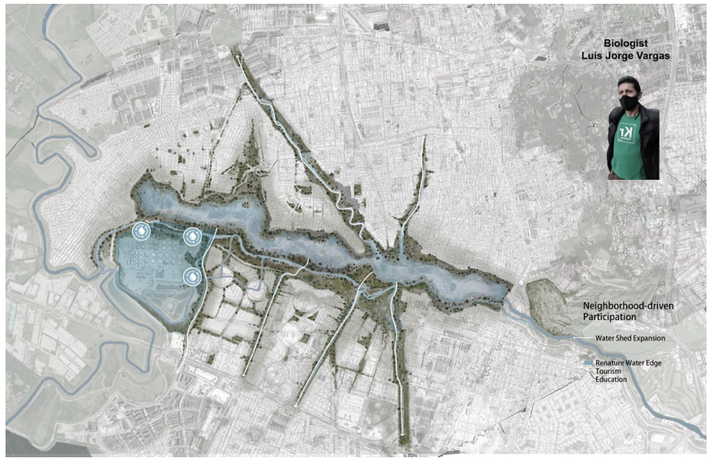
Connecting wetland and surrounding communities development



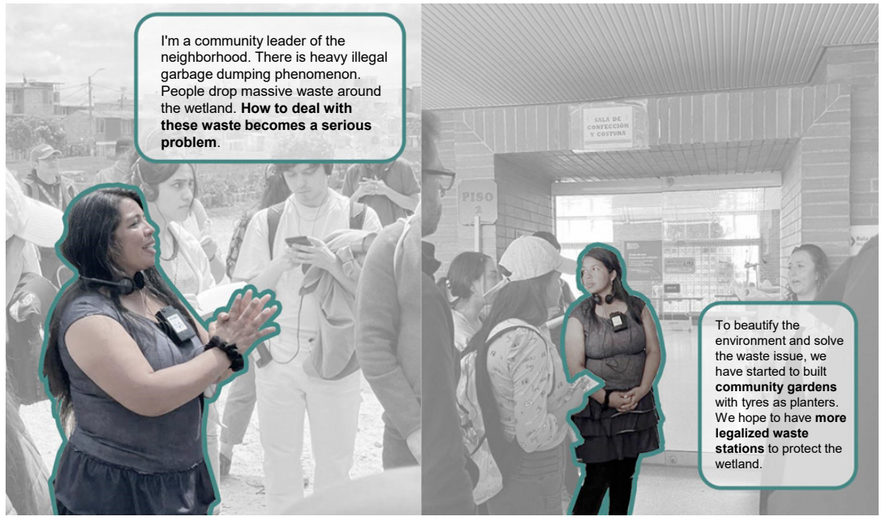
Interaction

wetland benefit communities stakeholder interests



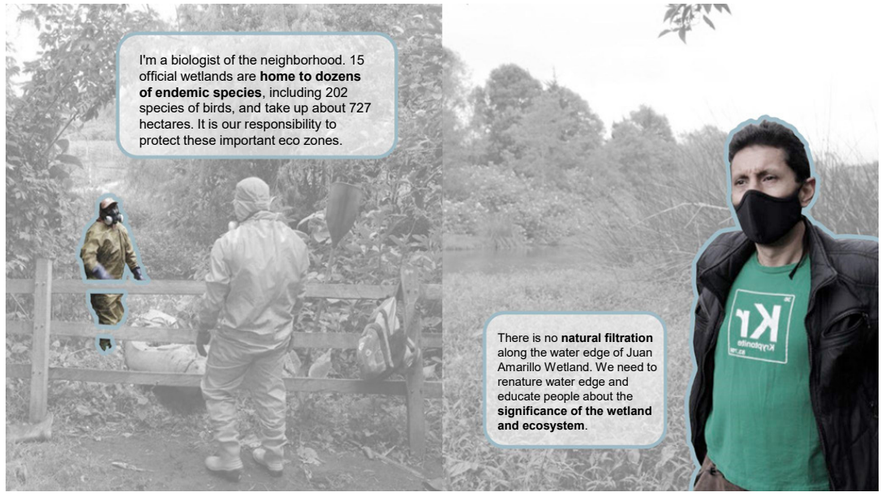


AREA 1 SELF-BUILT SETTLEMENT

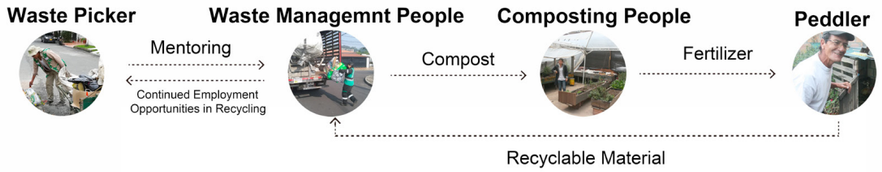


AREA 2 SUBA SETTLEMENT

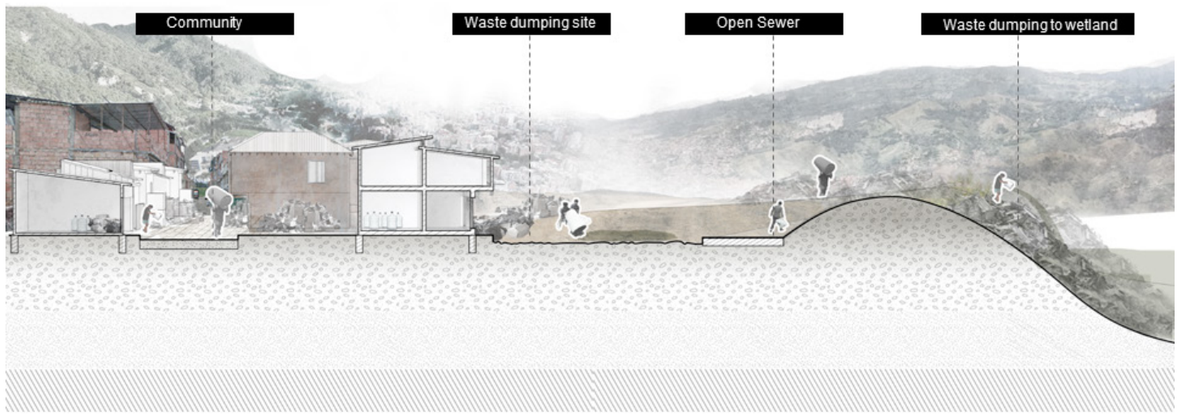
AREA 3 WASTEWATER TREATMENT PLANT



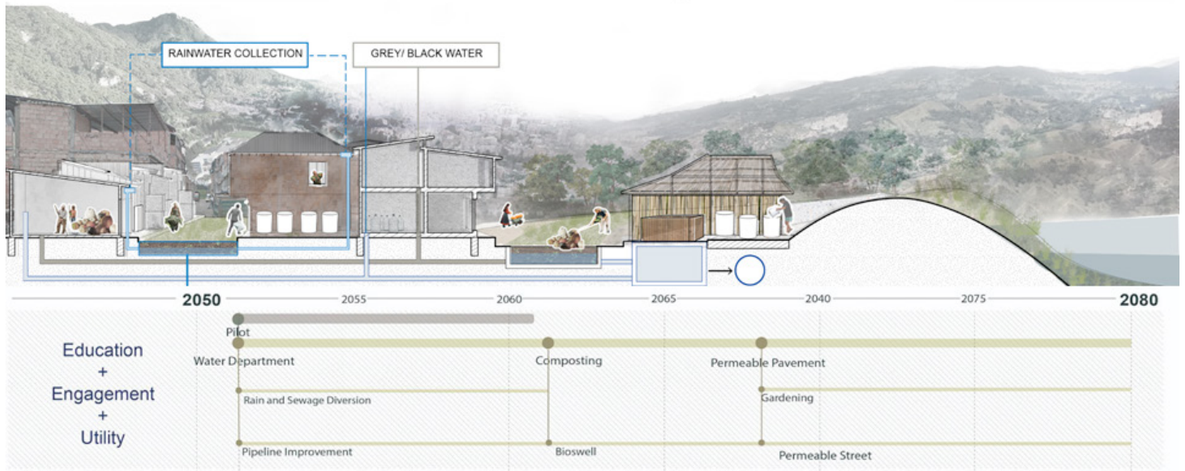
AREA 1 SITE PLAN
SELF-BUILT SETTLEMENT



AREA 1
2023-2080 INTERVENTION SECTION



2023



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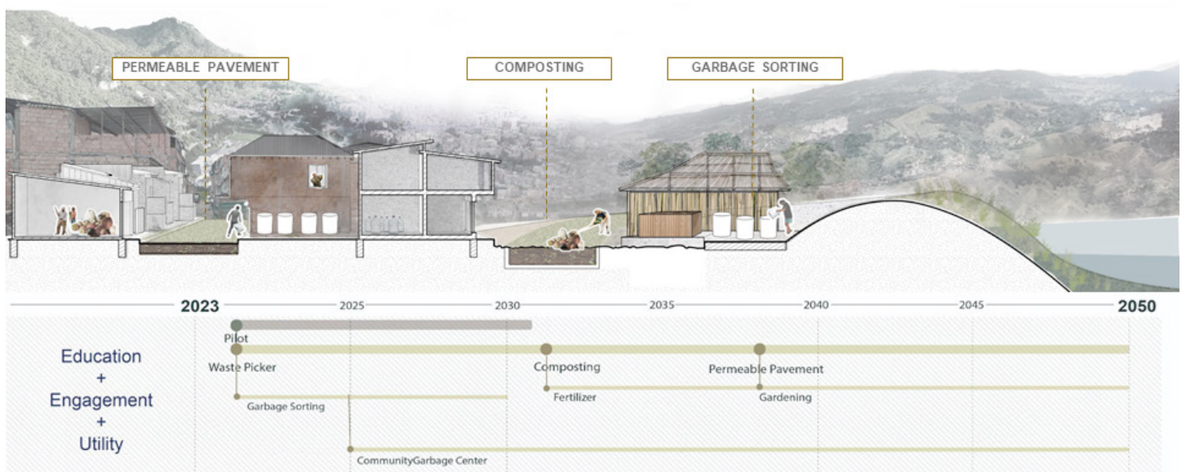
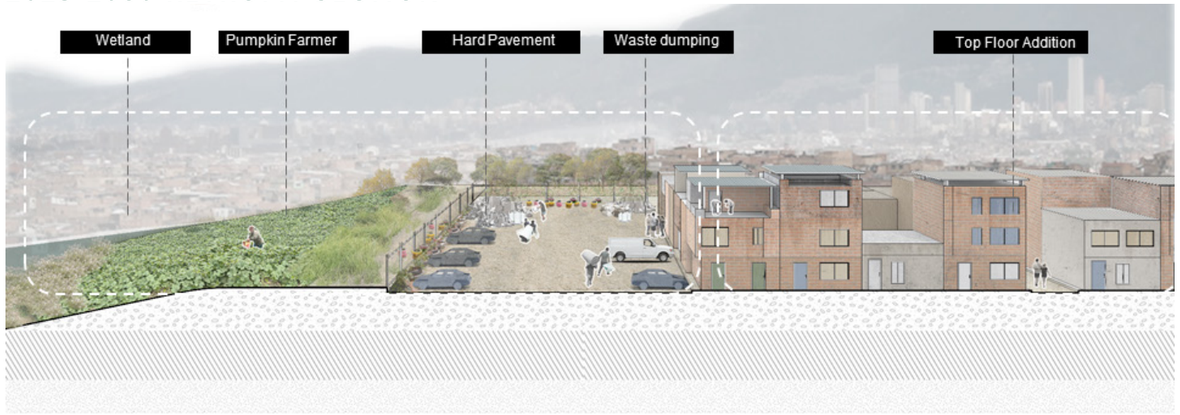


2080

AREA 2 SITE PLAN
SUBA SETTLEMENT

AREA 2
2023-2080 RETROFIT SECTION



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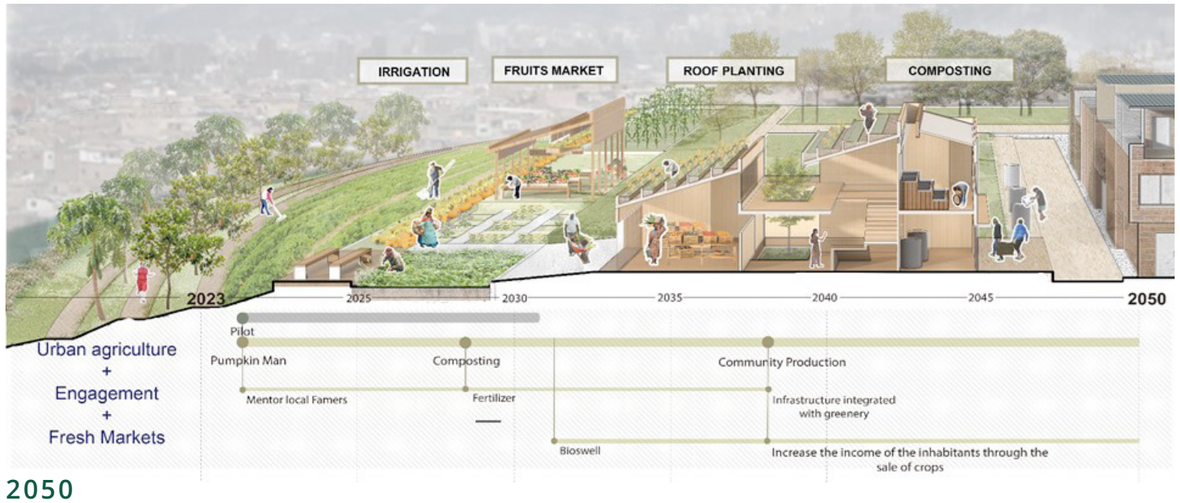

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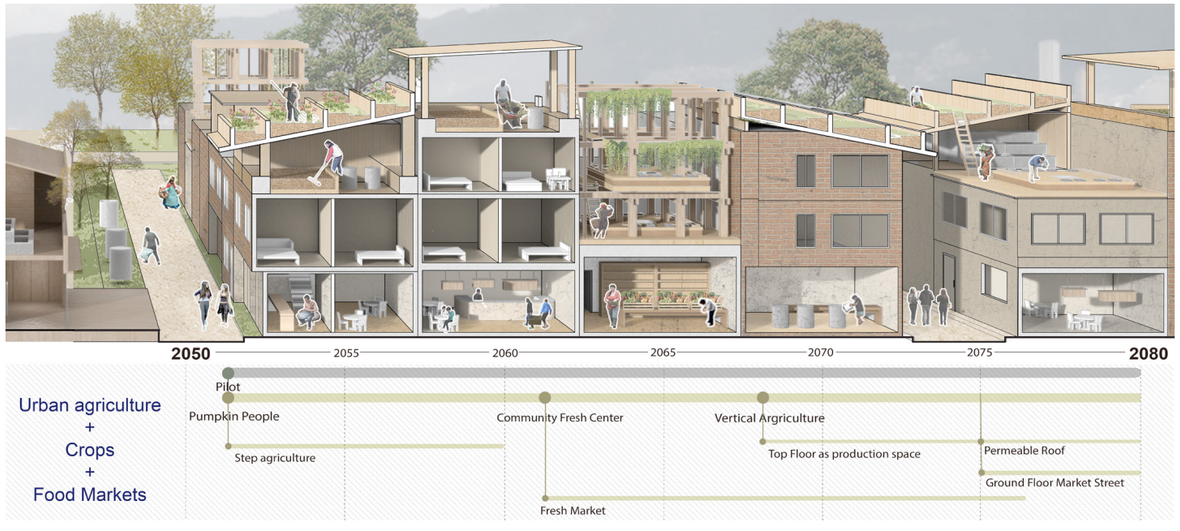
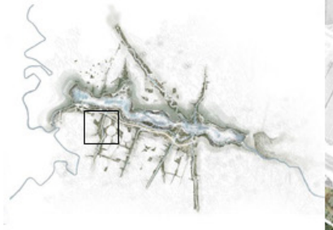
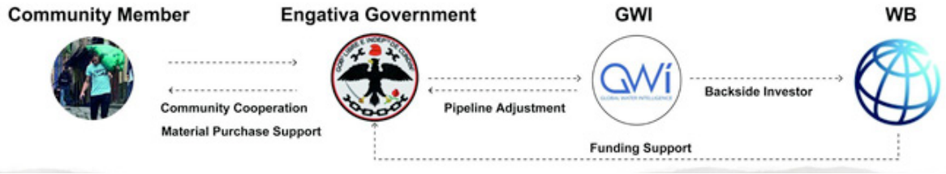


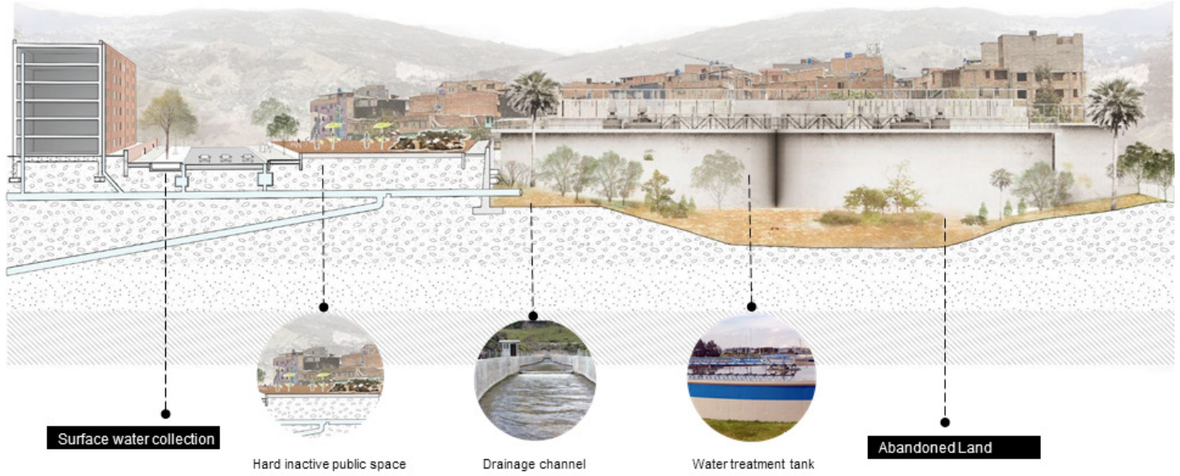
2080

AREA 3 SITE PLAN
EL SALITRE
WATER TREATMENT





AREA 3
2023-2080 IMPORVEMENT SECTION



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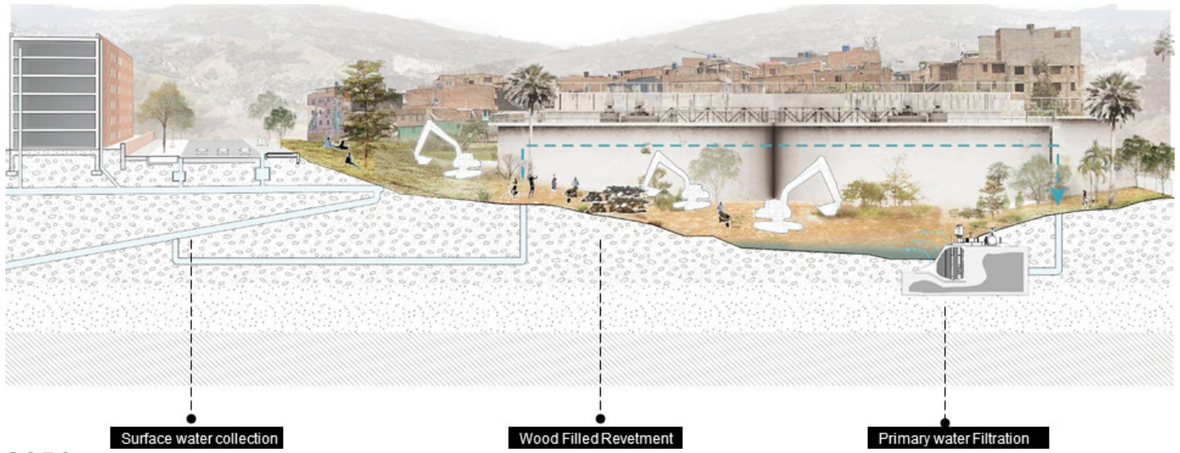

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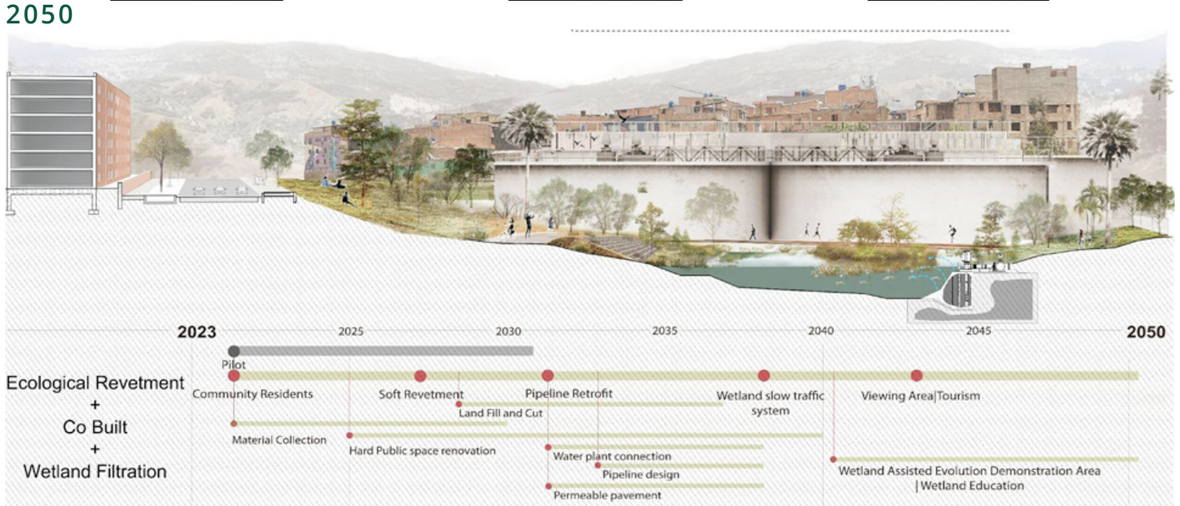

2080

02. 2022 FALL-STUDIO II

ATLANDA AFTER PROPERTY

ATLANDA, USA

Vine City, Mercedes-Benz Stadium

TEAM

Chongyang Ren

Ruxuan Zheng

Jiani Dai

Jingyi Liu

INSTRUCTORS

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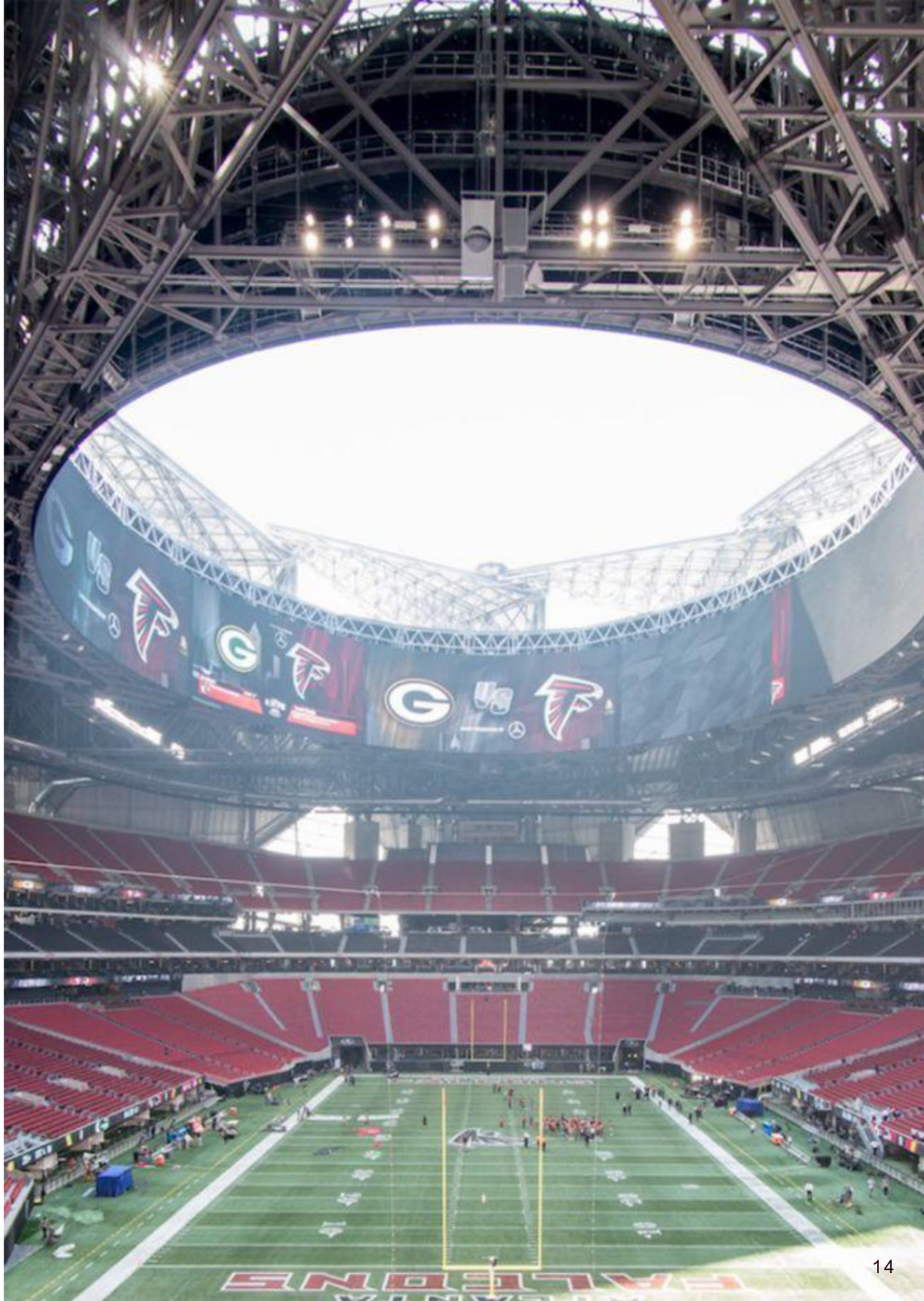
DEFINITION OF PROPERTY

Property is a framework for social, economic, and political rights that are the critical drivers of intergenerational wealth. It is a form of power. Each individual's Social identity is defined by this power hierarchy through property ownership in possession of time and spatial occupation.

AFTER PROPERTY

Property should not be a vehicle for individualism that translates itself to an investment vehicle and wealth generating commodity. Space is not a zero-sum game where one person's loss is another's gain, nor is it a resource that must be used by only one person at a time. Rather, proprietorship will be annexed by partnership. Against the disposition of property and land speculation caused by mass media and the commodity-economy spectacle.



1985

1990, SPORTS CITY

1995

2000

2005

2010

2015

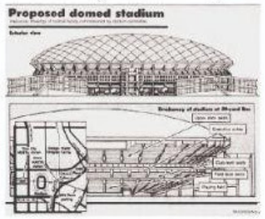
2020

Now

1866,
Friendship Baptist Church Established

1881,
First HBCU in Georgia that was founded by Black people for Black People

1986,
Dome Early Stadium Proposal



1986,
- $100k in **job training** and job placement for residents .

- $10 million trust fund for **150 new houses** in Vine City

1987,
Mount Vernon Baptist held a 24-hour vigil protesting the Dome Stadium.

1992,
Dome Established

1992,
- job training hadn't happened. Given part time jobs and laid off after dome construction.

- Only 20 of the 150 planned homes were built.

1996, Olympic

2004,
20% Vacant Lots of Land in Vine City

2007,
Morris Brown College lost their accrediation

2014,
Land Cleared for Mercedes Benz Stadium

2014,
Friendship Baptist Church Original Location got demolished

Mount Vernon was demolished

2017,
- Mercedes Benz Stadium Established
- Dome Implosion

2017,
Moved in brand-new sanctuary

Stadium and Vine City has a strong contast of urban pattern

41% Vacant Lots of Land in Vine City

2021,
Morris Brown College get their accrediation back

House value raised, tenants were forced to move out. makes it lopsided in the community

100 Cameras on utility poles

Provided preferential housing for police to live

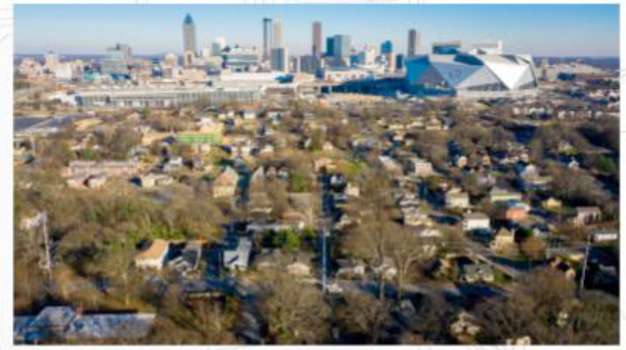
placed 700 Westside residents in jobs at the stadium

Gentrification of the comuunity

Residents are being watched in every moment

The homeless people who really needed jobs didn't get oppertunites

CURRENT VINE CITY CONDISTION



Rodney Cook Sr. Park

The Home Depot Backyard

Mercedes Benz Stadium

Morris Brown College

Central United Church

Friendship Baptist Church

Legend:

Vacant Lots

- Private Ownership
- Church's Ownership
- Government's Ownership
- Company's Ownership
- Existing Green Space
- Community Spaces and Churches

FUTURE VINE CITY STAKEHOLDERS

LUMBER COMPANY

purchase

acquire

VINE CITY

INVEST ATLANTA

Westside Future Fund

$50 million

CENTRAL Baptist Church

beulah

fbcc Friendship Baptist Church Atlanta, GA

NEW WOOD CITY COOPERATIVE

TEMPORARY HOUSING

RECLAIMED WOOD

LUMBER

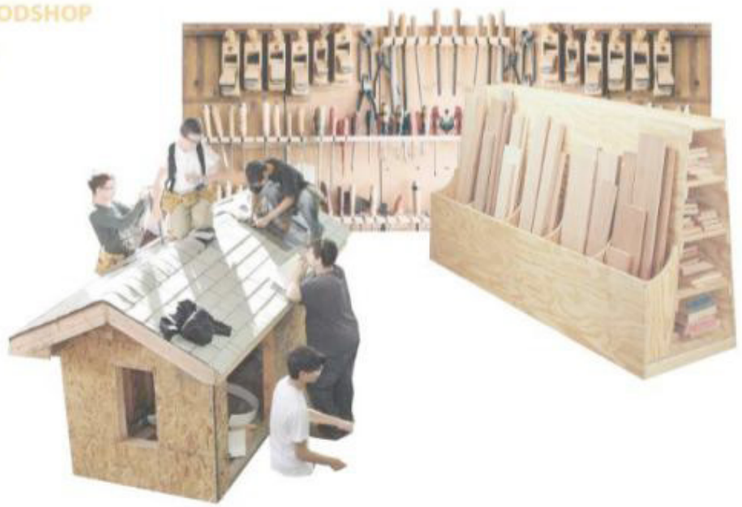
$50 million initial funding

WOODWORKING EDUCATION

MORRIS BROWN COLLEGE

VACANT LOTS

WOODSHOP



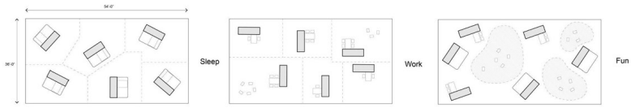
x% of rent collected

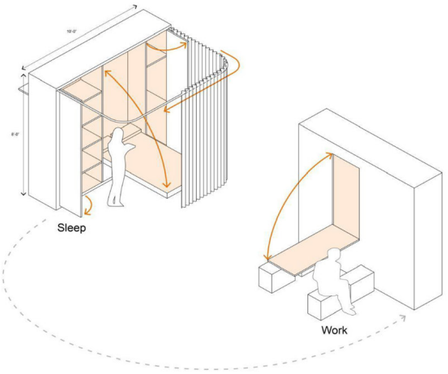
x% of profit collected

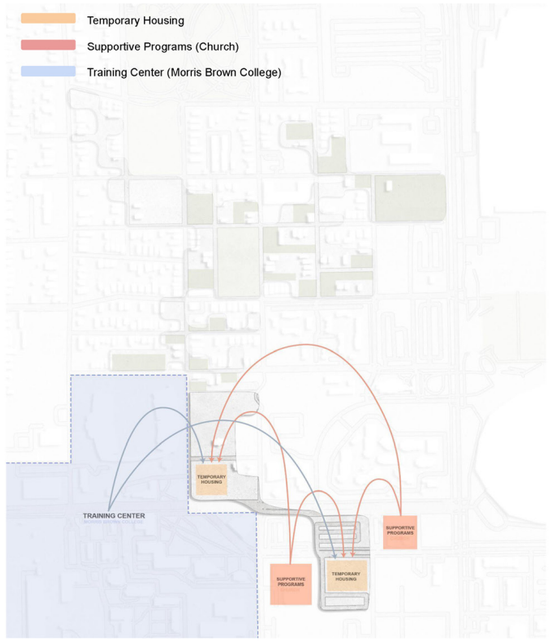
WOOD HOUSING

WOOD PRODUCTS

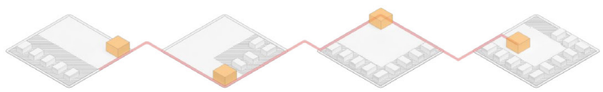
Step 01: Training Program + Temporary Housing

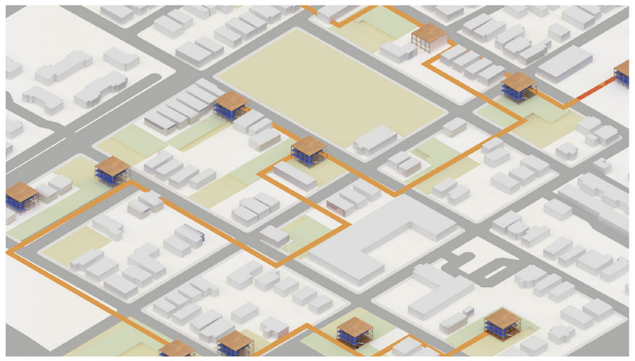




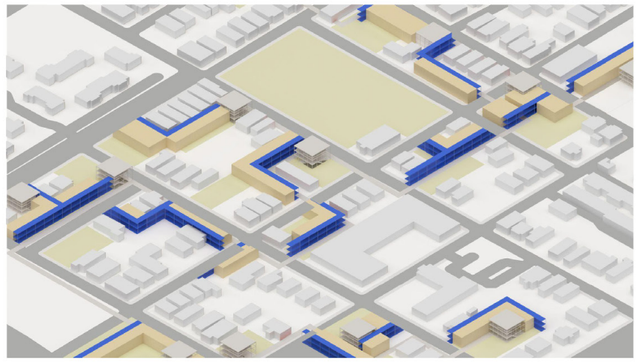


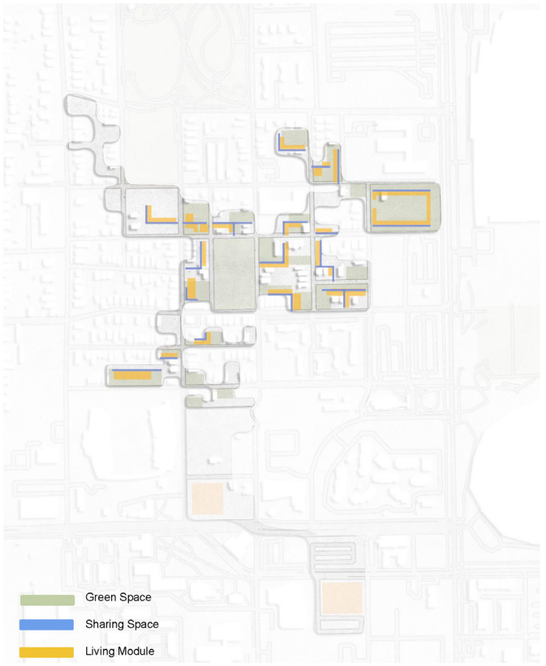
Step 02: Ground Floor Connector+Woodshop



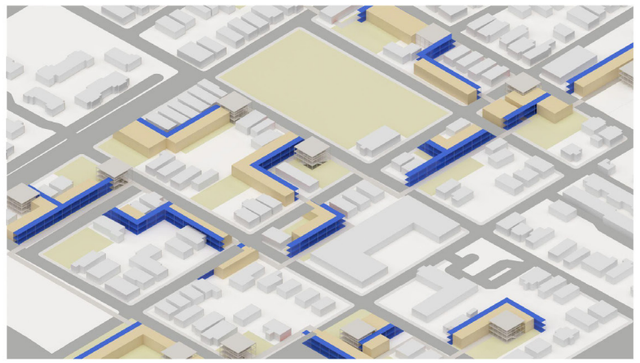


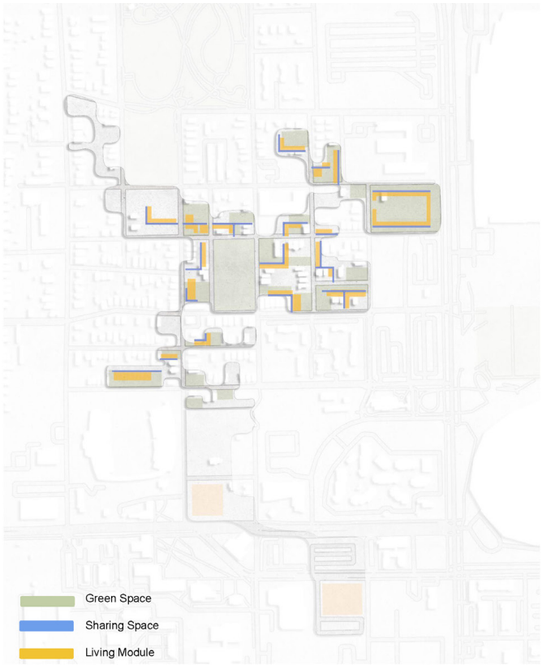
Step 03: Shared Front Porch

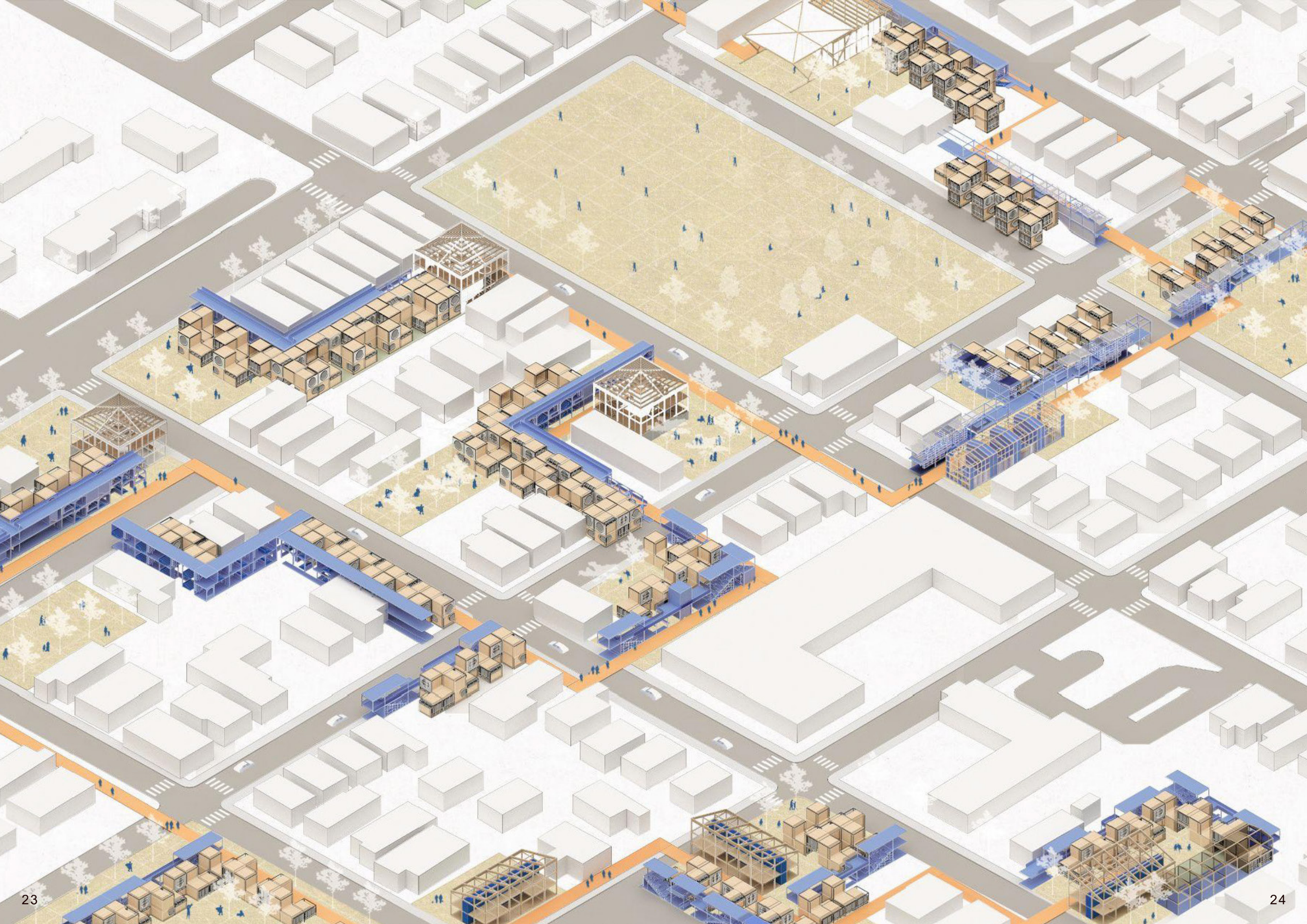


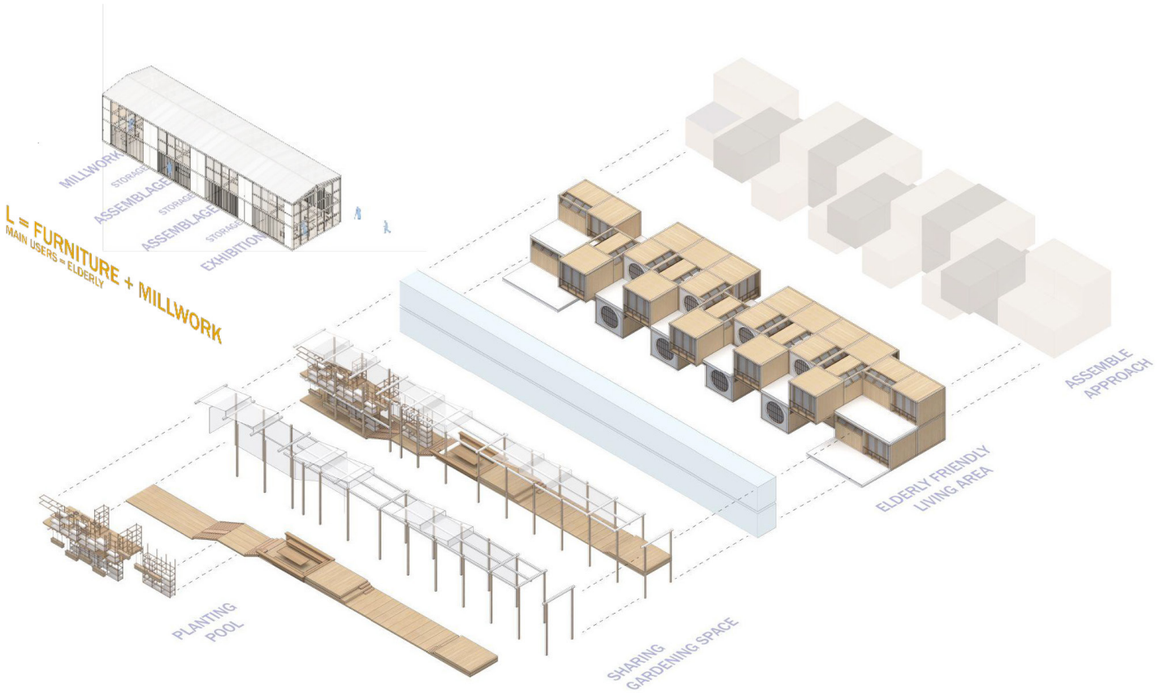


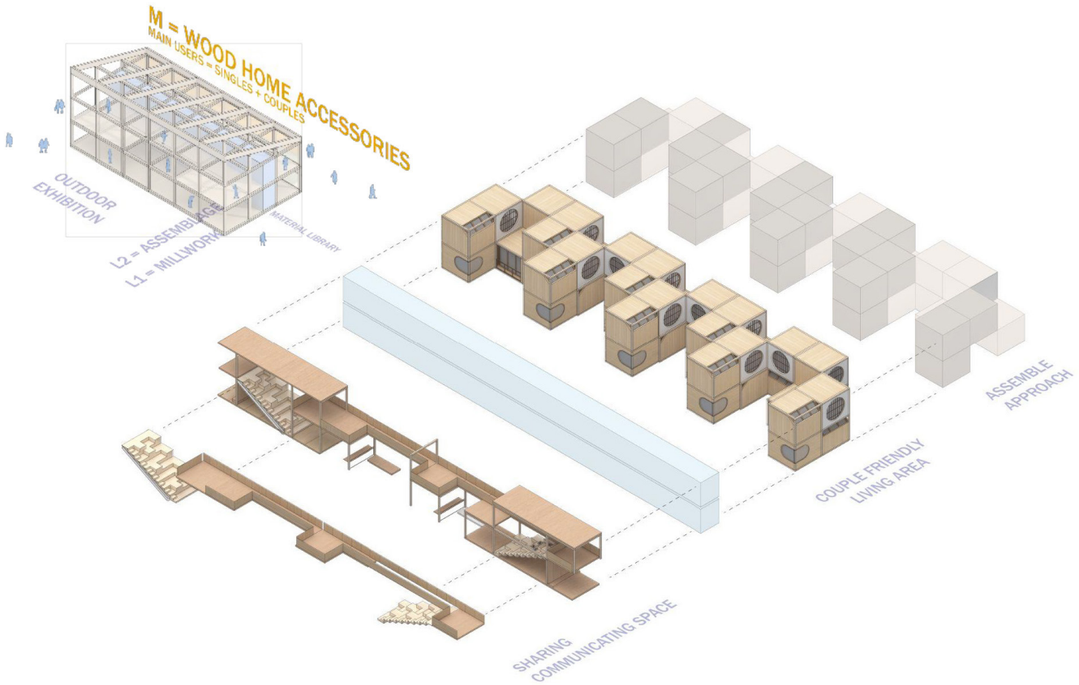
Step 04: Living Module

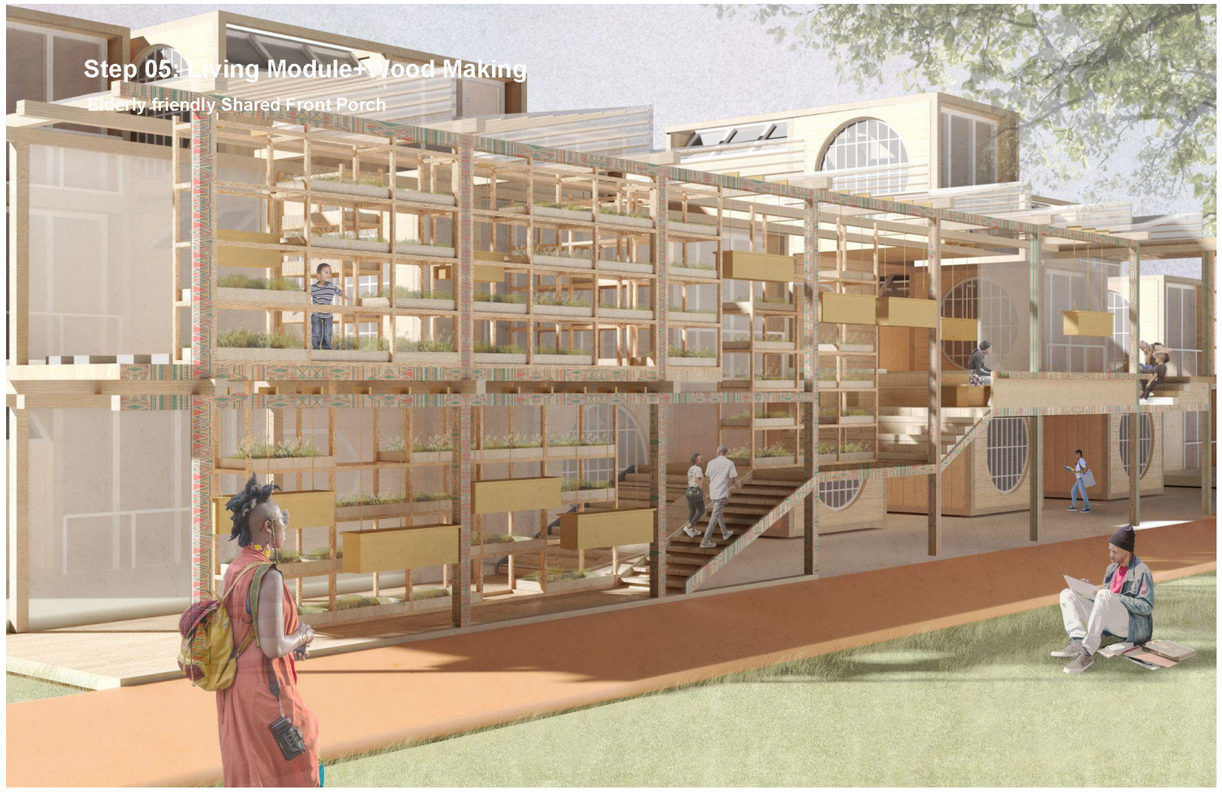


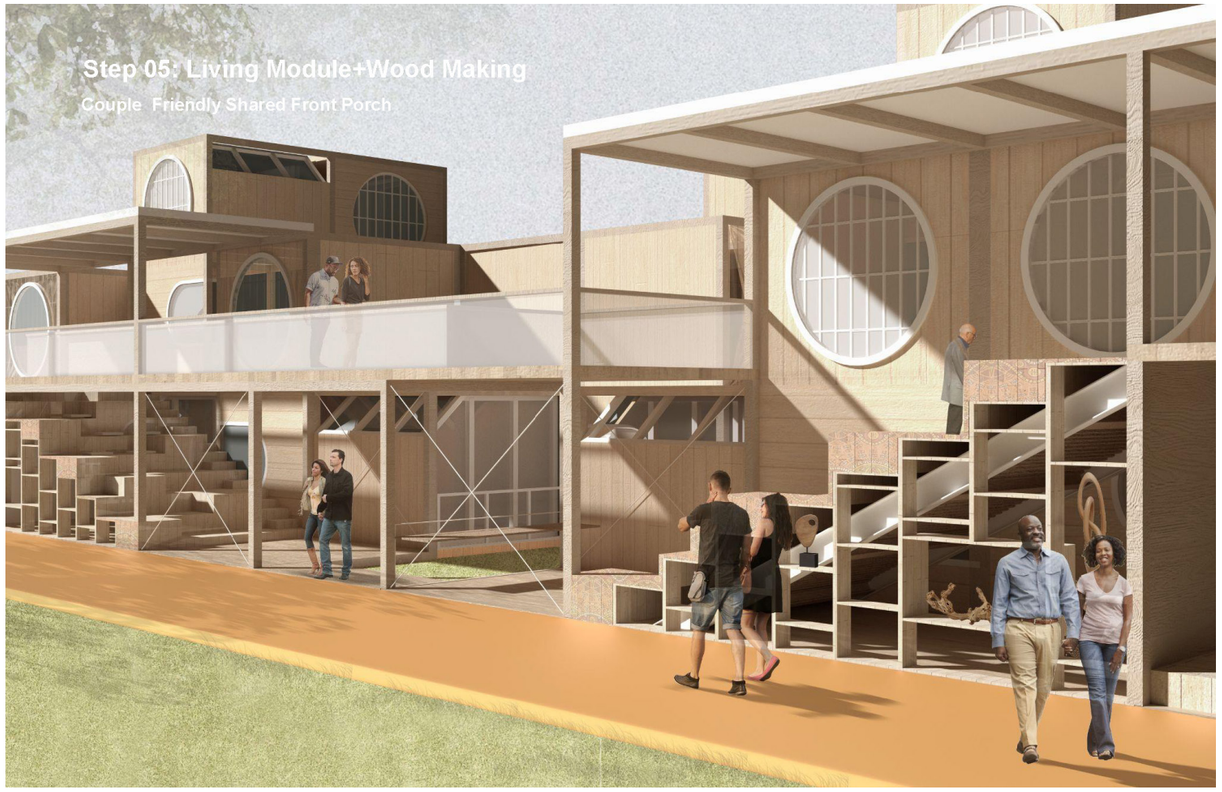


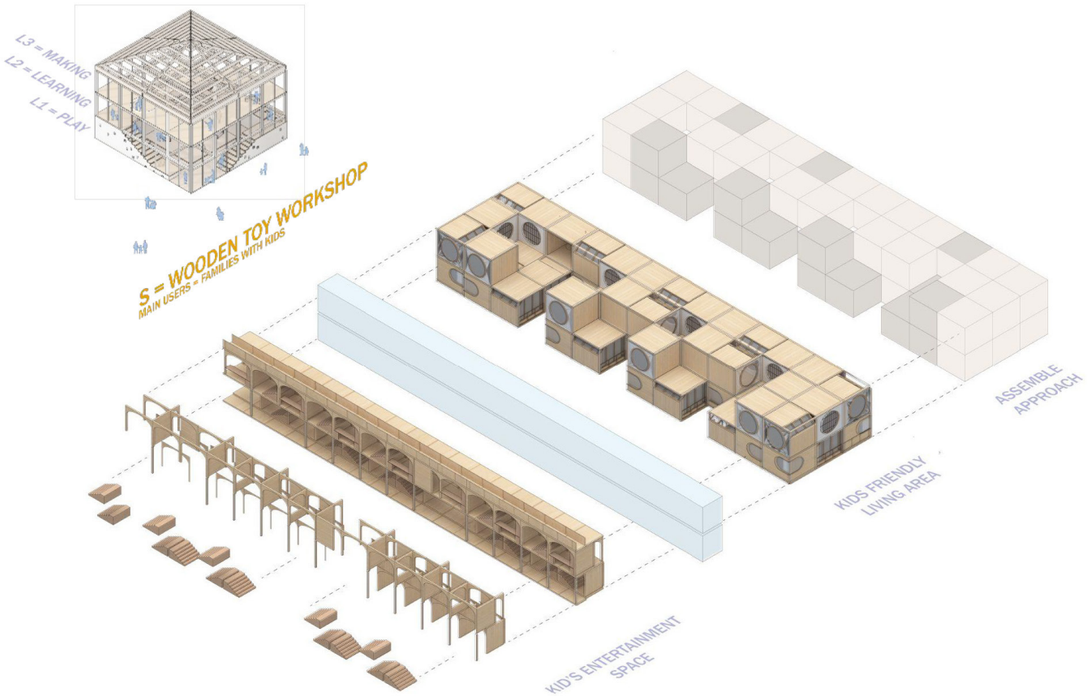


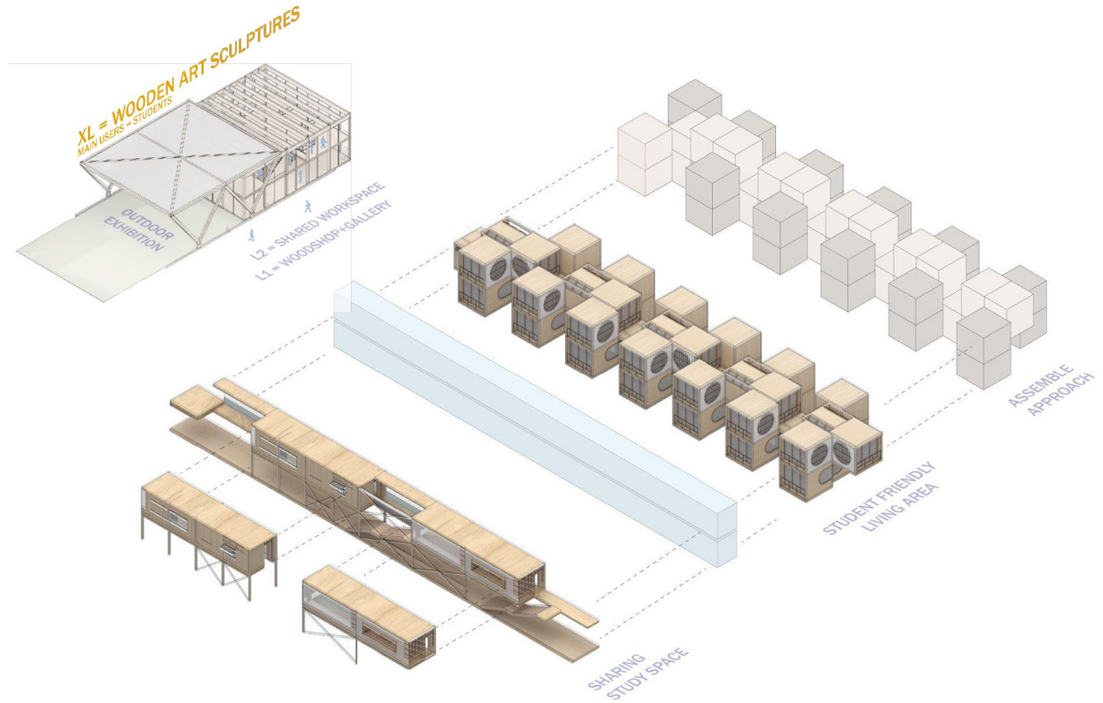

L = FURNITURE + MILLWORK
MAIN USERS = ELDERLY
MILLWORK
STORAGE
ASSEMBLAGE
STORAGE
ASSEMBLAGE
STORAGE
EXHIBITION
ASSEMBLE APPROACH
ELDERLY FRIENDLY LIVING AREA
PLANTING POOL
SHARING GARDENING SPACE


M = WOOD HOME ACCESSORIES
MAIN USERS = SINGLES + COUPLES
OUTDOOR EXHIBITION
L2 = ASSEMBLAGE
L1 = MILLWORK
MATERIAL LIBRARY
ASSEMBLE APPROACH
COUPLE FRIENDLY LIVING AREA
SHARING COMMUNICATING SPACE


Step 05: Living Module+Wood Making
Elderly friendly Shared Front Porch

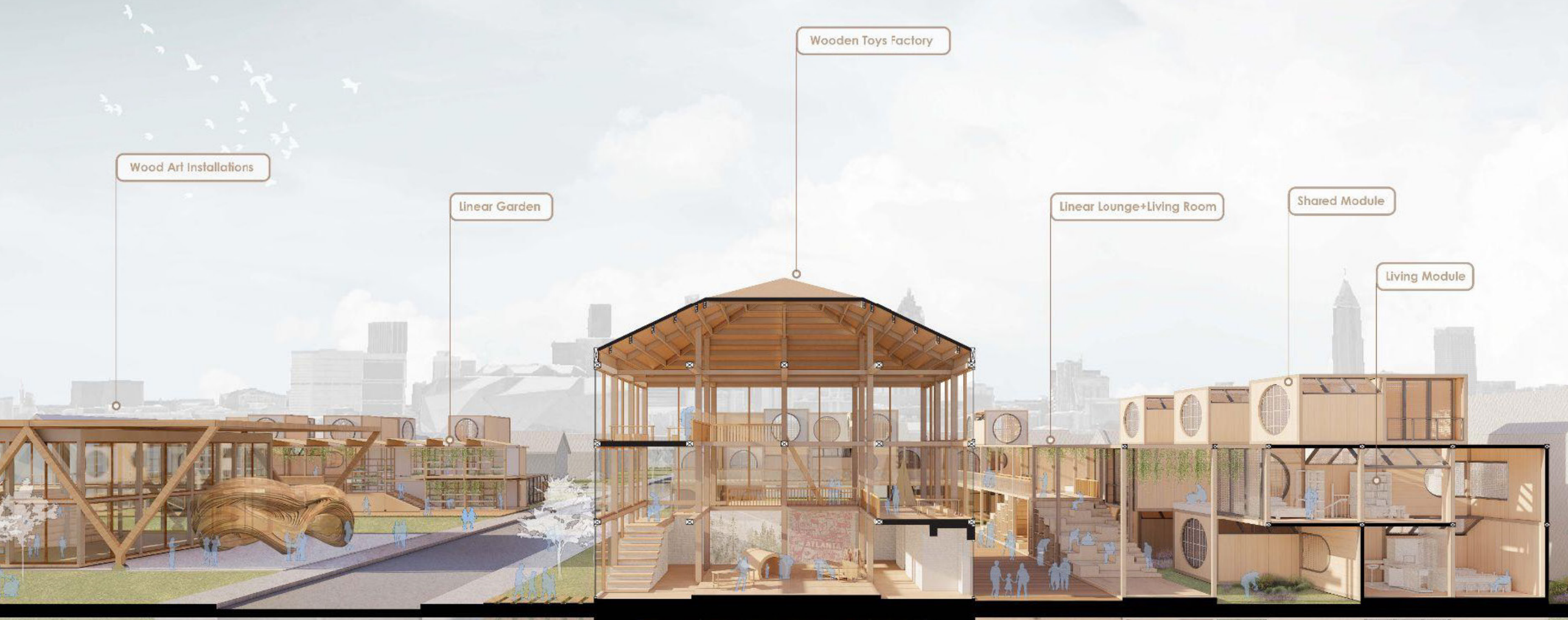

Step 05: Living Module+Wood Making
Couple Friendly Shared Front Porch


L3 = MAKING
L2 = LEARNING
L1 = PLAY
S = WOODEN TOY WORKSHOP
MAIN USERS = FAMILIES WITH KIDS
ASSEMBLE APPROACH
KIDS FRIENDLY LIVING AREA
KID'S ENTERTAINMENT SPACE


XL = WOODEN ART SCULPTURES
MAIN USERS = STUDENTS
OUTDOOR EXHIBITION
L2 = SHARED WORKSPACE
L1 = WOODSHOP+GALLERY
ASSEMBLE APPROACH
STUDENT FRIENDLY LIVING AREA
SHARING STUDY SPACE


Step 05: Living Module+Wood Making
Kids Friendly Shared Front Porch


Step 05: Living Module+Wood Making
Student Friendly Shared Front Porch


Wood Art Installations
Linear Garden
Wooden Toys Factory
Linear Lounge+Living Room
Shared Module
Living Module

03. 2022 SUMMER-STUDIO I

WATER WORKS IN CARNASIE

ATLANDA, USA

Carnaise,New York City

TEAM

Verena Krappitz

Vir Jignesh Shah

Saloni Shah

Chongyang Ren

INSTRUCTORS

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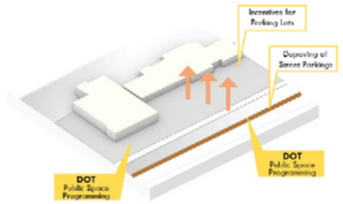
KEY STATEMENTS

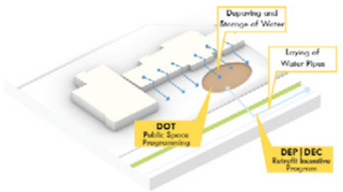
As a group, we share a strong belief that a threat to the community can be mitigated and transformed into a resource. Acknowledging our beliefs and challenges, we as a group have started this initiative to develop a plan, a new multi-dimensional perspective addressing the issues of extreme heat and storm water floods. This relationship is a vital one for the sustaining of an urban context under the umbrella of climate crisis. Through our project we intend to express these strongly held convictions towards solving problems that exist in the urban context

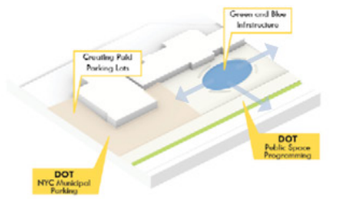
Our approach was to really understand the nature of these two conditions and through our project represent how can they perform efficiently as a confluence/fertilizing system. Hence, we came up with, '[RE] Sourcing Storm water as a Resource'. We look at storm water not just as a resource but in reference to its context as well. This is a water hierarchy diagram that shows how the storm water can be used a resource in various ways.


WE LIKE TO STAY MORE INDOORS
I CANNOT AFFORD THE FLOOD INSURANCE
I cannot afford to pay for more Damages.
My family will have no place to stay
Need cool Space MORE PARKS
It's RAINING! NO SCHOOLS TODAY!
I cannot play on the playground its too hot there
Invest in better Water Systems
We have a lot of flooding outside our streets for days after rains.
My child cannot stay without air conditioner.
I went some groceries ... ~~let go out ....~~ OH NO! its too hot out there let's order it ONLINE
TRAINS CANCELLED! I can't afford a day OFF
~~I am money~~ No more storms please!
Repair the broken sewer pipelines.
There are no visitors during the day.
I CANT WALK TO MY FRIENDS PLACE FOR LUNCH!
I feel like working at furnance"
THE HEAT IS KILLING ME AT WORK!
My Backyard is filled with water again!
IF the heat wave continue ~~fel~~ I will be out of business
We cannot stand one more storm like Sandy.
I had all my furniture damaged

IMPROVEMENT PLAN OF SCHOOL SHED AREA







Who is Benifited?

Employees around the commercial developments

The Restaurant Owners and People working there

Adult Day Care residents and Caretakers

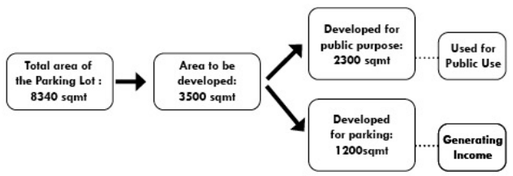
Children form Child Daycare centre

Who is the Stakeholder?

NYC Department of Transport

NYC Department of Environmental Protection

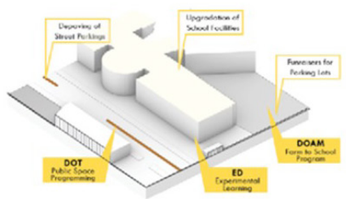
NYC Department of Environmental Conservation

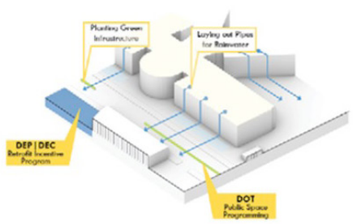


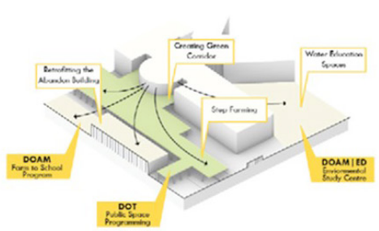
BEFORE

AFTER

IMPROVEMENT PLAN OF INDUSTRY SHED AREA







Who is Benifited?

Children going to the school

Teachers who teach at the school

Who is the Stakeholder?

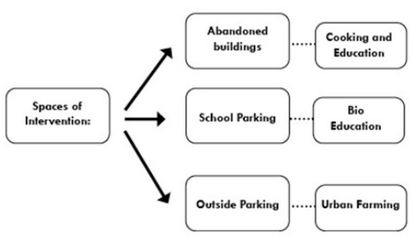
NYC Department of Transport

NYC Department of Environmental Protection

NYC Department of Environmental Conservation

NYC Department of Education

NYC Department Environmental Prot



BEFORE

AFTER

04 RECOMBINANT URBANISM

Post-Olympic Restructured Cities

TOKYO, JAPAN

TEAM

Chongyang Ren

Saloni Shah

Simran Gupta

Rohin Sikka

Yuka

INSTRUCTORS

David Grahame Shane

KEY STATEMENTS

The 1964 Olympics were a rare chance for officials to implement the kind of rapid, sweeping changes that would disrupt lives and require cultural sacrifices. Visitors found not a war-scarred city but a modernizing metropolis, with state-of-the-art transportation whizz ing between an upgraded airport and smart new hotels. More than that, the enormous footprint of military facilities in Tokyo's southwest became the city's new economic and cultural center—emblems of a peaceful, prosperous future.

Around the transformation of Tokyo's urban transportation after the first Olympic Games, many urban renewal projects were built around Shinjuku Station and Shibuya Station. This project want to reseach to the spatial conversion relationship among them used by termenology of enclave, heterotopia, and armature.

Archi Citta

1603 Edo period begins. Fishing village around Tokyo bay.

1657 Major fire in Edo claims over 100,000 lives

1718 Firefighting organizations established.

1721 First population census conducted (Edo's population about 1.3 million).

1868 New Meiji government established. Meiji era begins. Edo renamed Tokyo and becomes a prefecture.

1872 First railway line opens between Shimbashi (Tokyo) and Yokohama.

1889 Constitution of the Empire of Japan promulgated. Tokyo City and 15 wards established.

1914 World War I begins (ends 1918). Red brick and tile Tokyo Station completed.

Cine Citta

1923 Great Kantō quake - devastates the city and turns it into a sea of fire

1925 Radio Broadcasting services launched

1927 First subway line opens between Asakusa and Ueno

1931 Tokyo airport opens in Haneda

1940 City underwent a merger bringing all the towns into the proper city. Expansion of the artificial Tokyo harbour

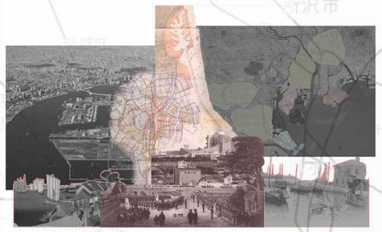
1941 Port of Tokyo opens

1942 World War II - city of Tokyo is completely destroyed in air raids

1950 After the war, the rebuilding of the city began to center on Tokyo

1953 Television broadcasting services launched

Telle Citta



1960 Kenzo Tange's Bay Plan aimed to address the challenges of urban sprawl faced by industrial cities.

1962 Tokyo's population reaches 10 million. Start of high economic growth period

1964 Olympic Games held in Tokyo

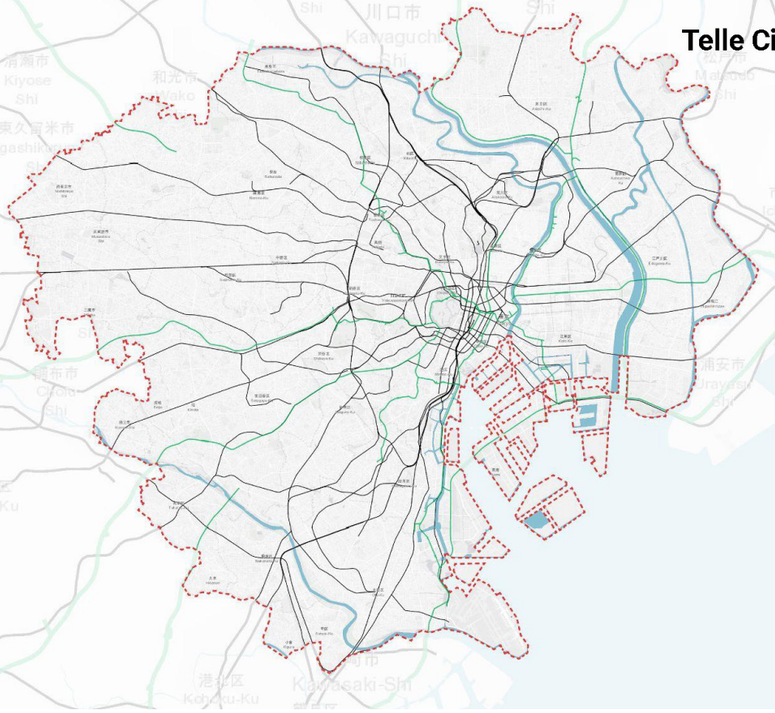
1968 Ogasawara Islands returned to Japan.

1973 Oil crisis occurs

1979 Fifth G7 Economic Summit Meeting held in Tokyo. Shunichi Suzuki elected Governor

1982 Long-Term Plan for the Tokyo Metropolis announced

1991 Tokyo Metropolitan Government Buildings move to Shinjuku from Marunouchi



Meta City

1993 Rainbow bridge opened - one of the world's largest natural bridges

2010 Haneda airport puts new runway and international terminal into service

2011 Tokyo vision 2020 formulated

2012 Tokyo Gatebridge and Tokyo Skytree opens

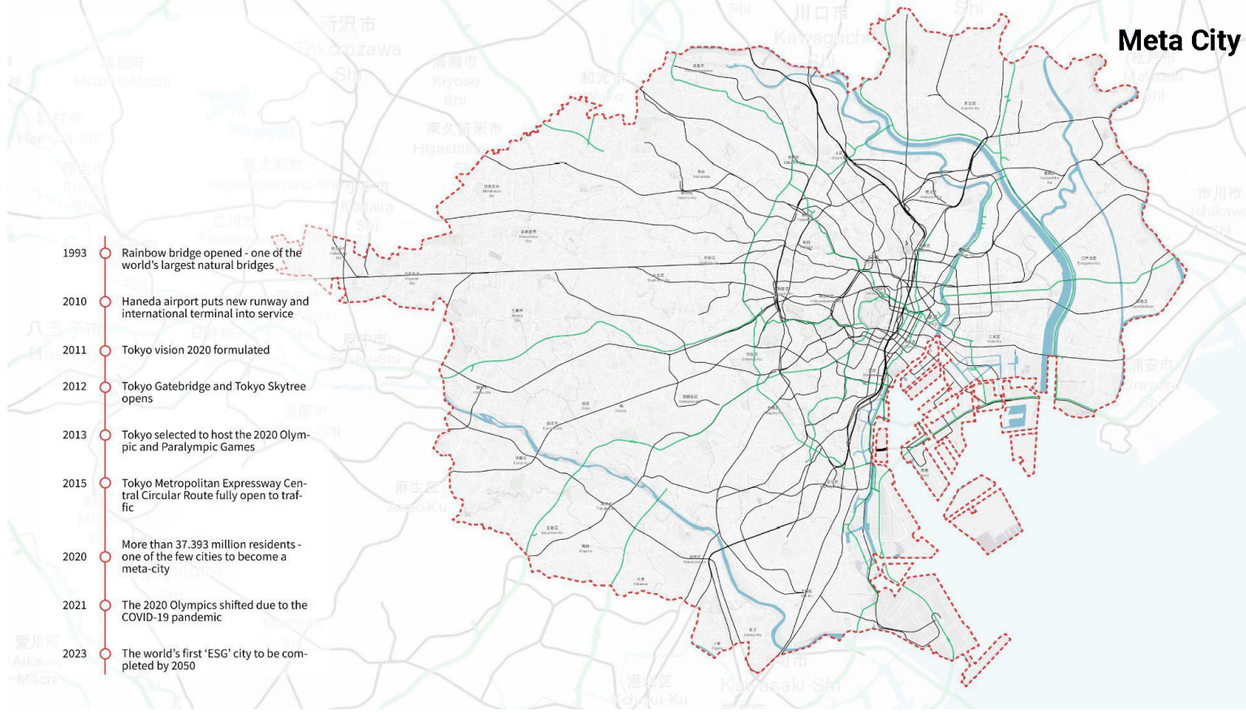
2013 Tokyo selected to host the 2020 Olympic and Paralympic Games

2015 Tokyo Metropolitan Expressway Central Circular Route fully open to traffic

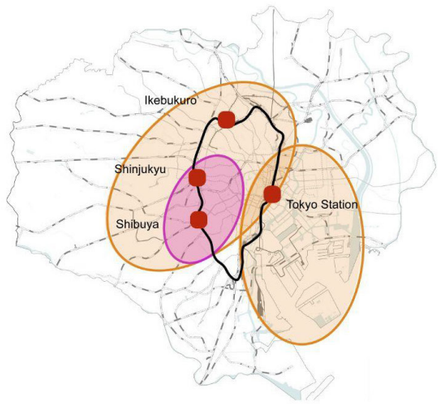
2020 More than 37.393 million residents - one of the few cities to become a meta-city

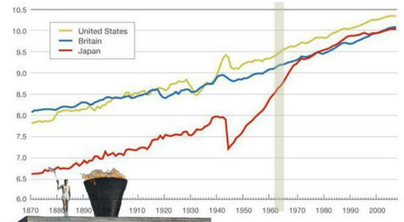
2021 The 2020 Olympics shifted due to the COVID-19 pandemic

2023 The world's first 'ESG' city to be completed by 2050

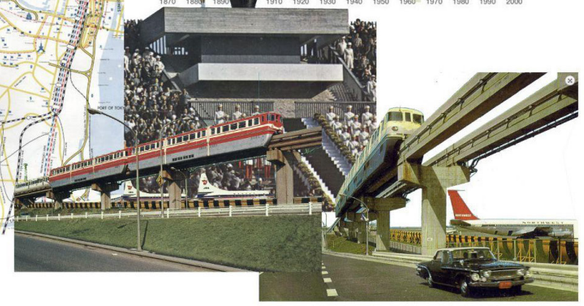


OLYMPIC STIMULUS:BOOSTING TRANSPORTATION INFRASTRUCTURE





Anchorman Yoshinori Sakai holds aloft the Olympic torch as he set ablaze the cauldron", Tokyo, 1964. Sakai, nicknamed 'Atom Boy' by the Japanese press, was born in Hiroshima on the day the city was atom-bombed (August 5, 1945), and was chosen to light the cauldron to symbolize Japan's postwar reconstruction and peace.



Tokyo Inner Transit Circle

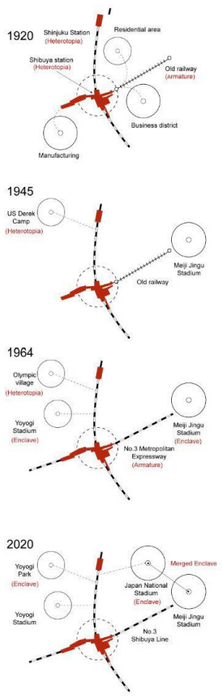
1964 Olympic Game Scope

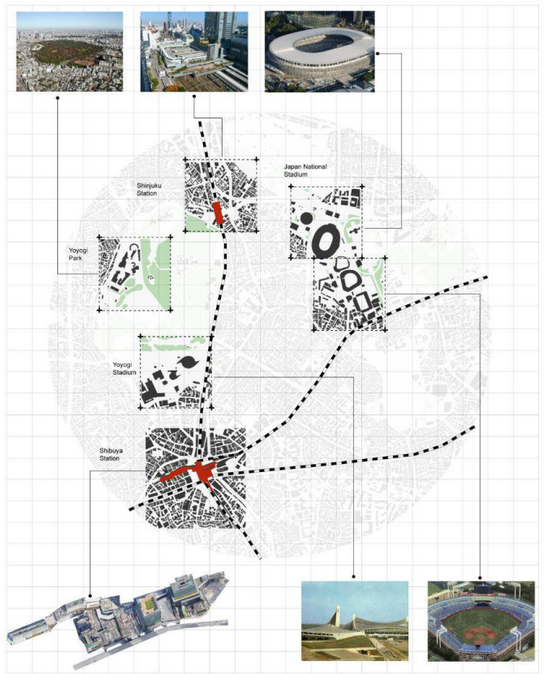
2020 Olympic Game Scope

The Tokyo Monorail, launched in 1964, marked the world's first use of a monorail for mass urban transportation. Skirting Tokyo Bay near Shinagawa, the innovative "Smart Car" connected Haneda to Hamamatsucho in just 15 minutes, reaching speeds of up to 100 km/h. Tokyo pioneered an extensive monorail network that transformed it into a futuristic metropolis, swiftly carrying commuters across town at tree-top level.

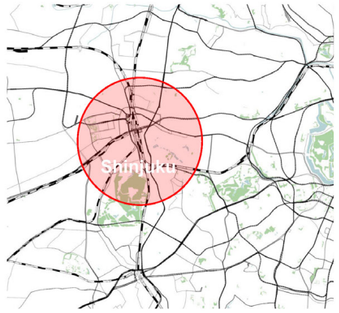
SHIBUYA DEVELOPMENT AND OLYMPIC1920-2020

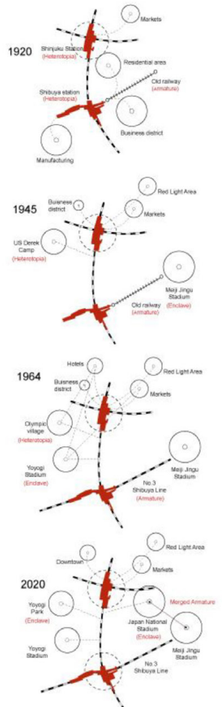
Shibuya Range

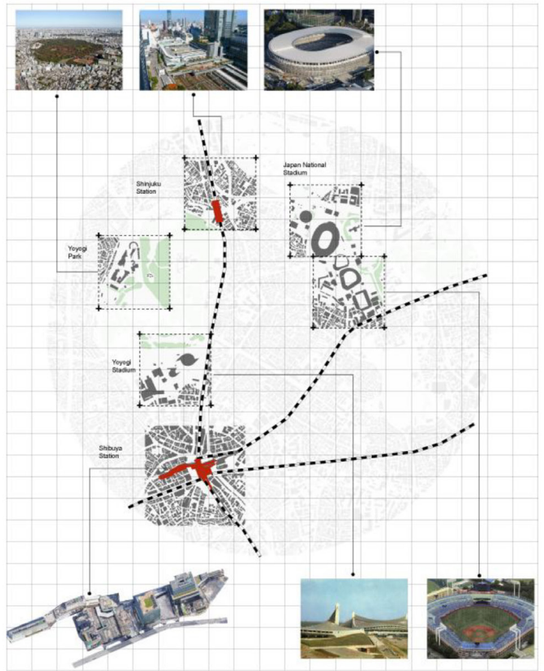




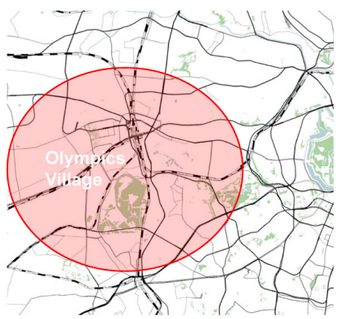
SHINJUKU DEVELOPMENT AND OLYMPIC1920-2020

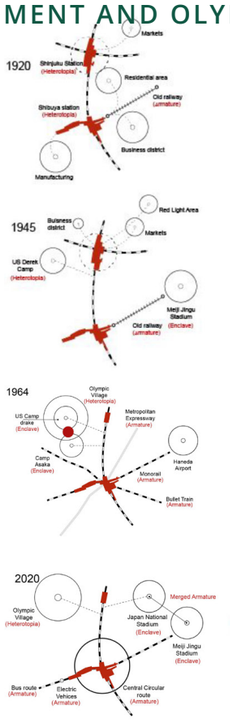


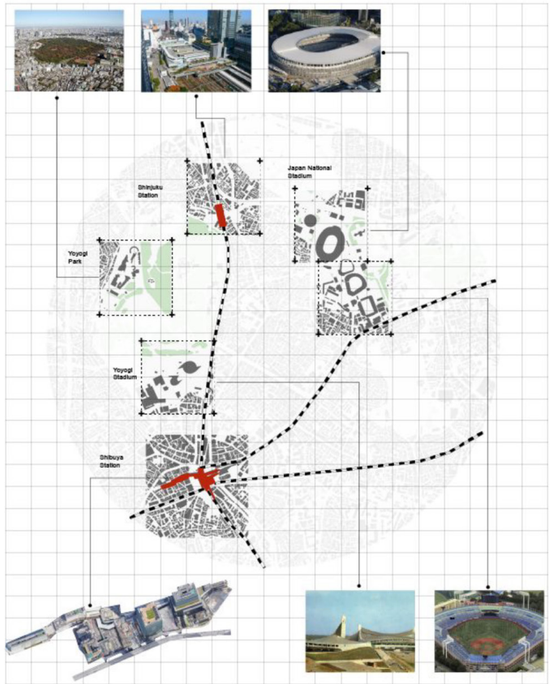


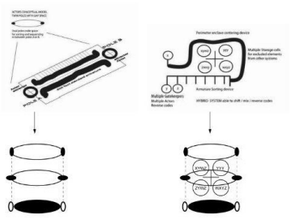


OLYMPICS VILLAGE DEVELOPMENT AND OLYMPIC1920-2020



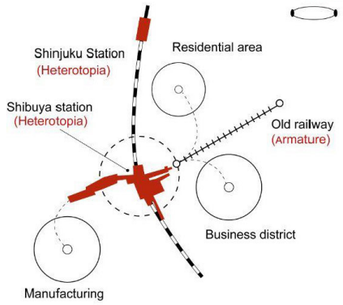






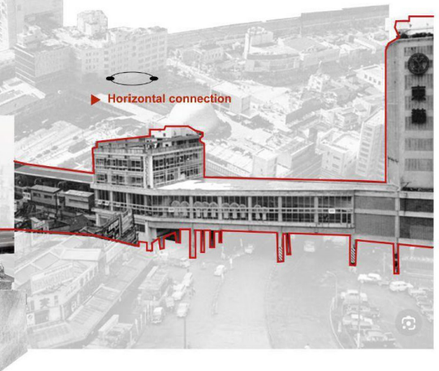
1920

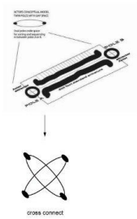
▶ Vertical Transportation



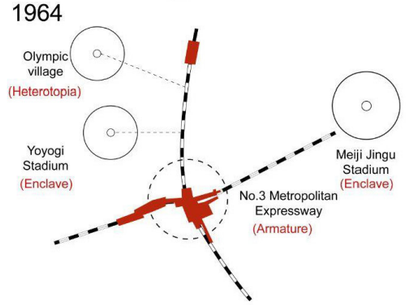
▶ Surface connection

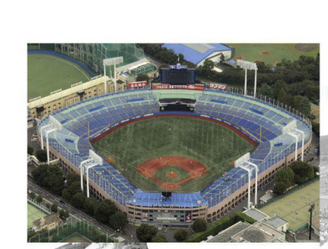
▶ Horizontal connection



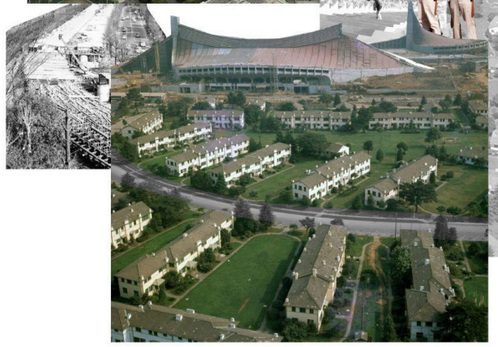


1964

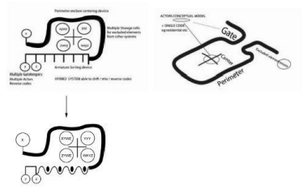




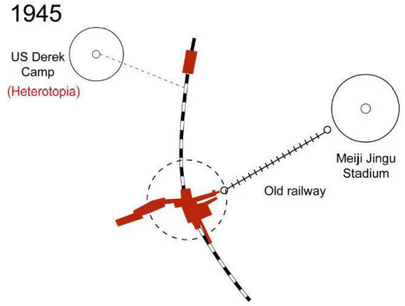
▶ New Gatekeeper

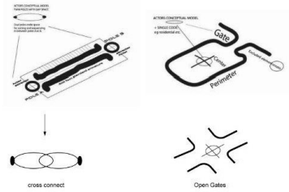


▶ New space road organization
New Armature

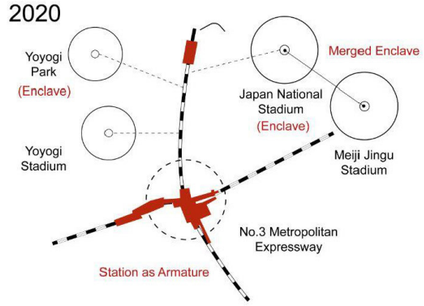


1945

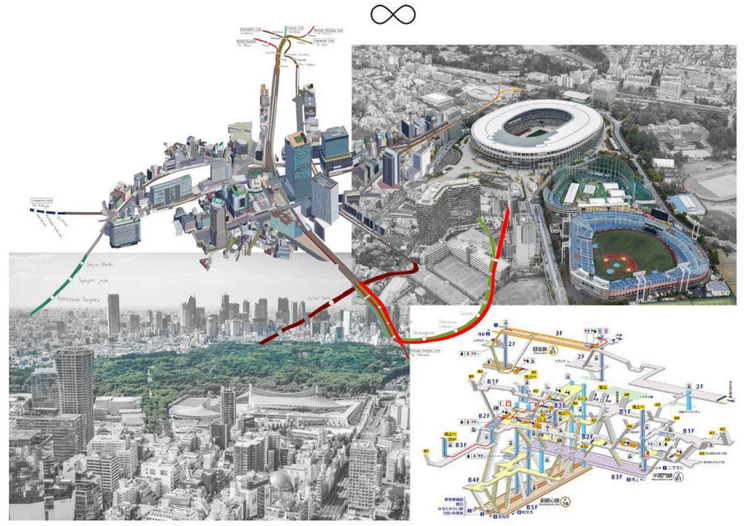




2020



▶ Merged Enclave



▶ Open Enclave,New Actor

05 COMFLICT URBANISM

FIVE CITIES, GOBAL SOUTH

TEAM

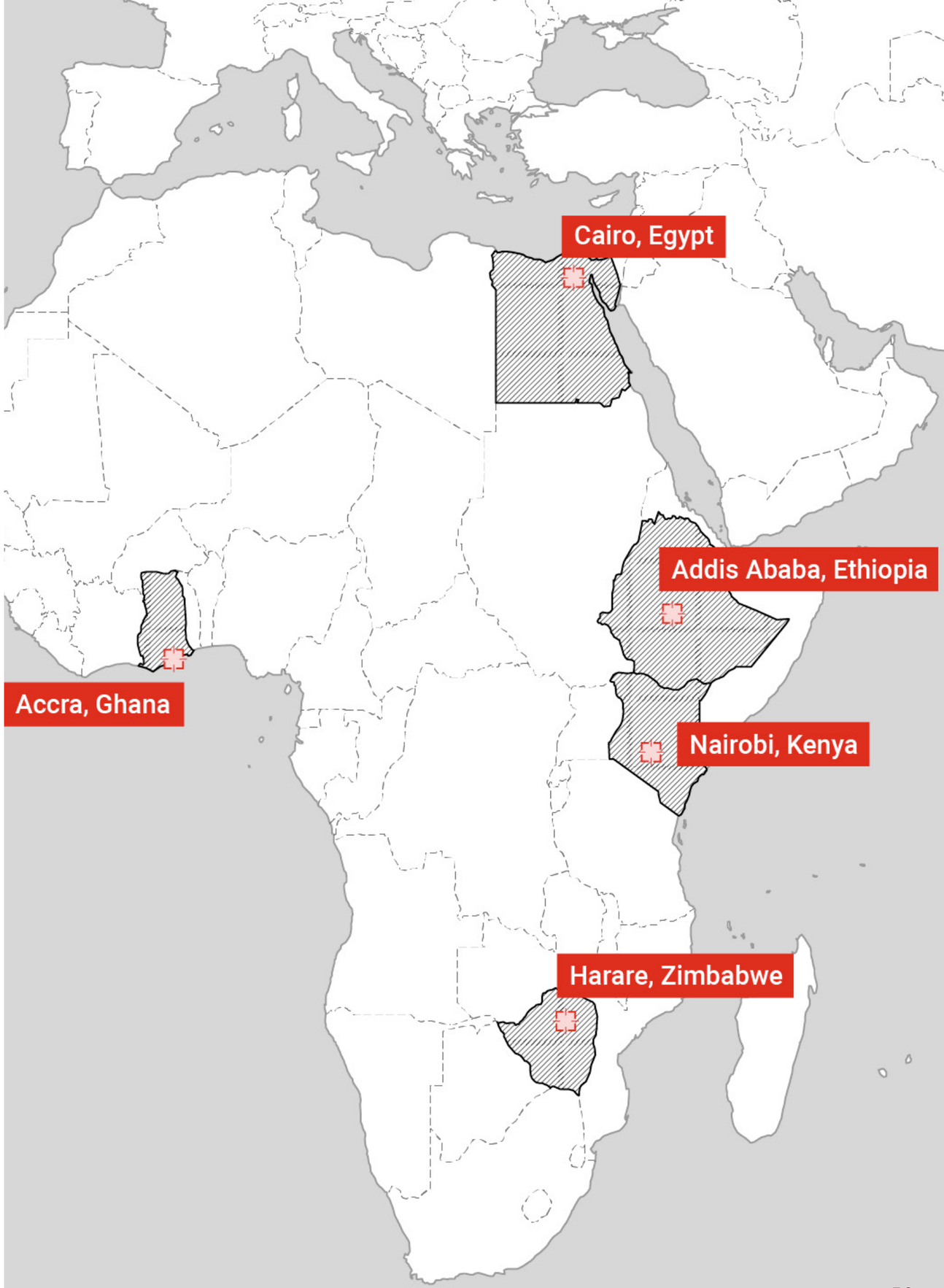
Chongyang Ren
Candice Siyun Ji
Kelly Shining Hong
Wei Xiao

INSTRUCTORS

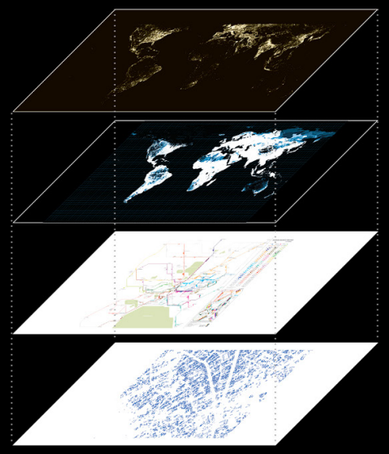
Laura Kurgan

KEY STATEMENTS

this project seeks to challenge the conventional use of night light imagery by integrating other sources of datasets to provide a more comprehensive understanding of the lives and infrastructure behind nighttime activities. Specifically, the project aims to compare nighttime light satellite imagery with informal mobility network datasets, census grid counts, and building footprint datasets produced by governments and researchers worldwide. By examining the relationship between the built environment, infrastructure, and human settlement at the scale of satellite imagery, the project aims to challenge existing assumptions about the geographies of belonging and infrastructure exclusion.



DATA SOURCE



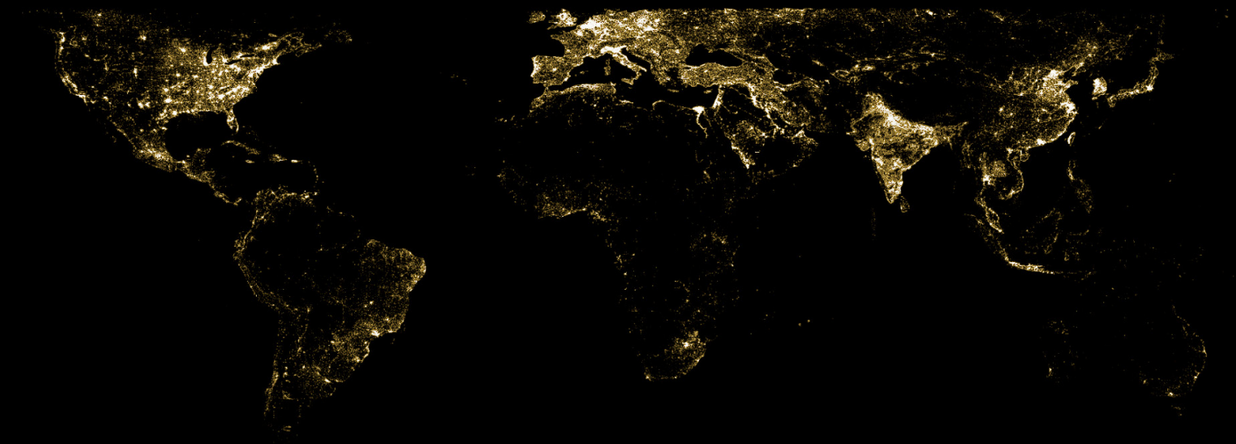
Nighttime Light Satellite Imagery
(Dataset: NASA VIIRS Night-time Lights)

Gridded Population Density
(Dataset: UN WPP-Adjusted Population Density)

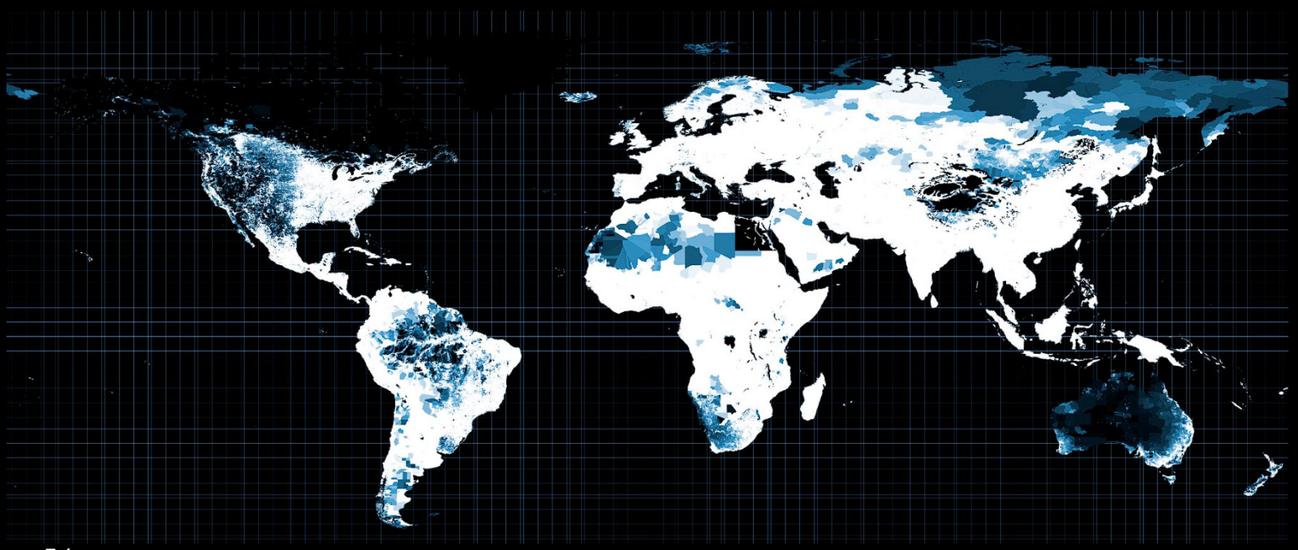
Informal Bus Transit System
(Dataset: DATUM)

Building Footprints
(Dataset: Microsoft Building Footprint / Google Open Buildings)

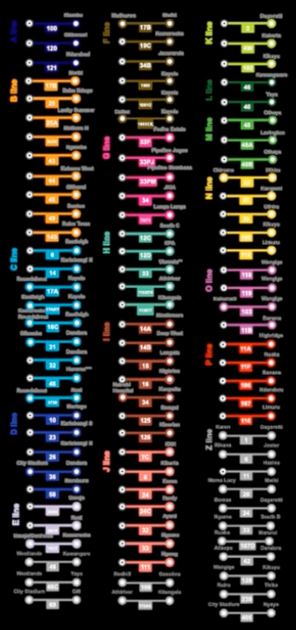
Layer 1: Night-time Light Satellite Imagery

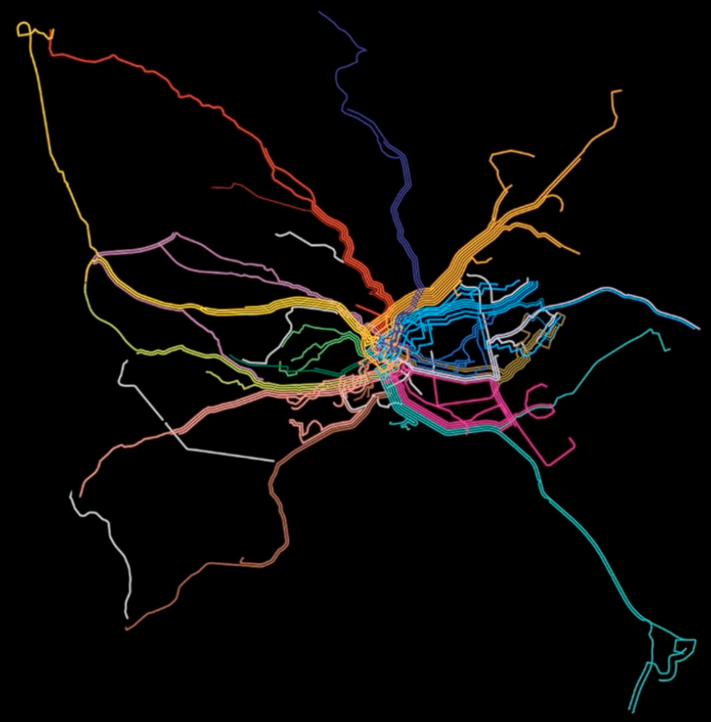


Layer 2: Gridded Population Density

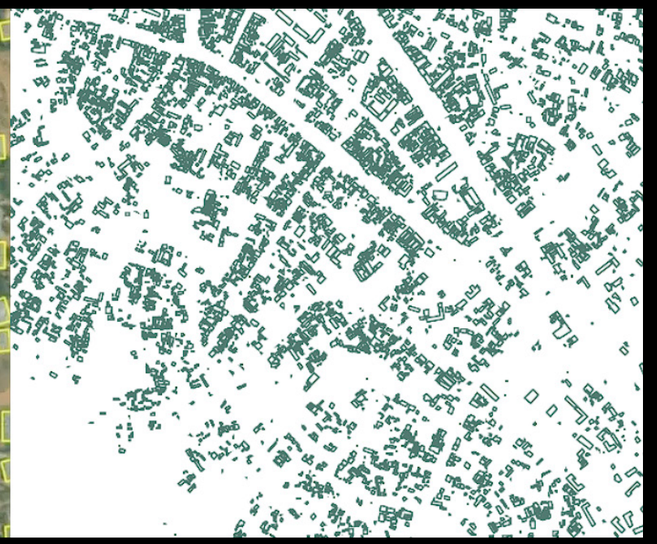


Layer 3: Informal Bus Transit System

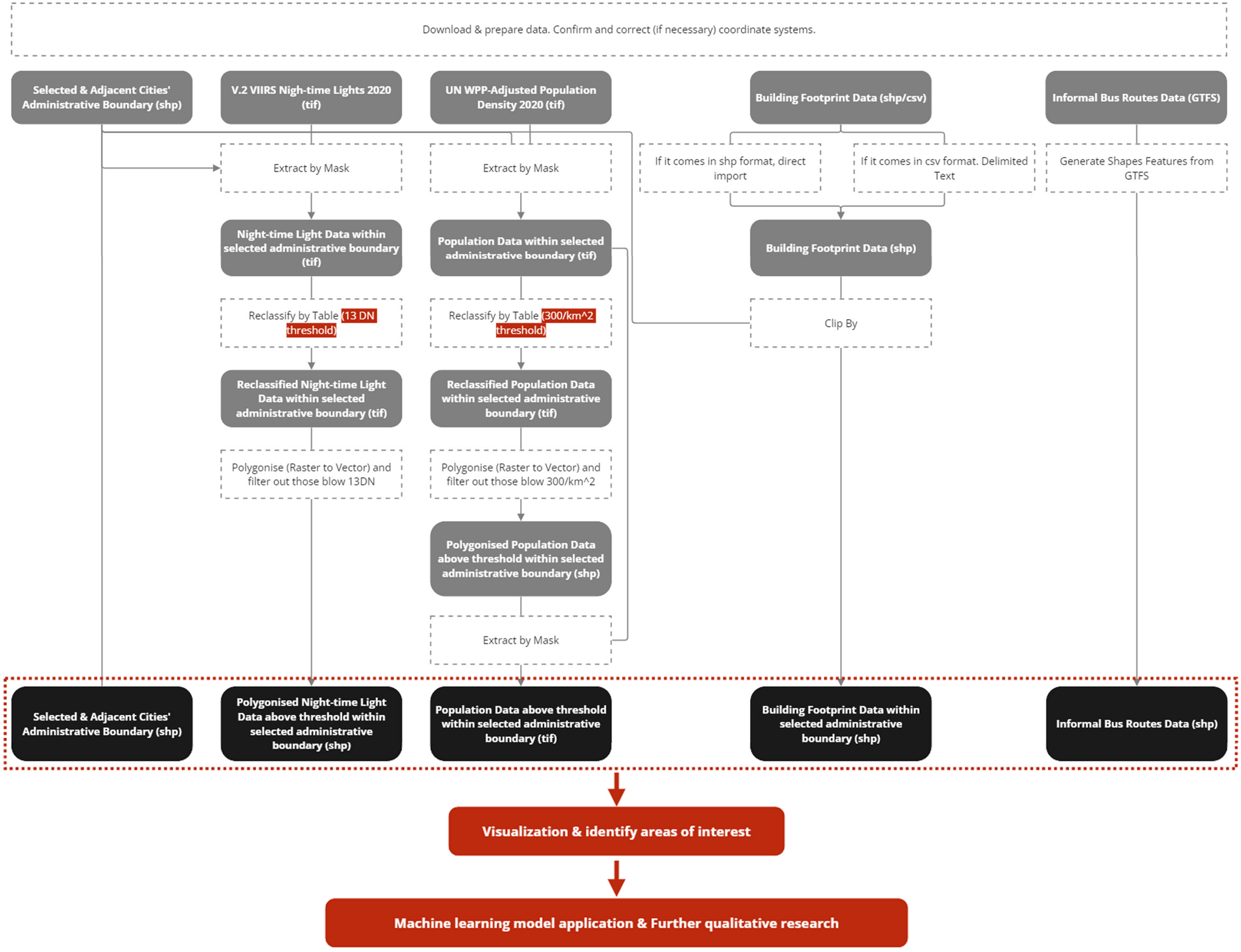




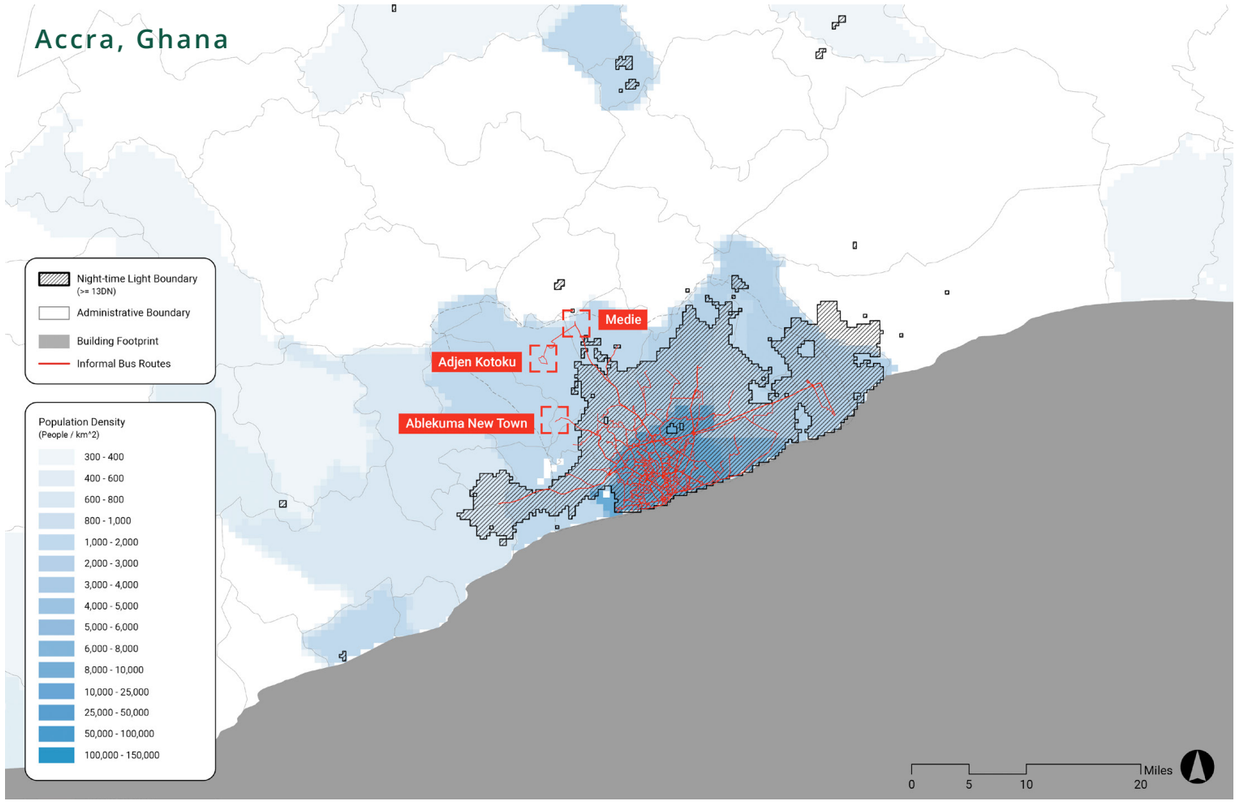
Layer 4: Building Footprints



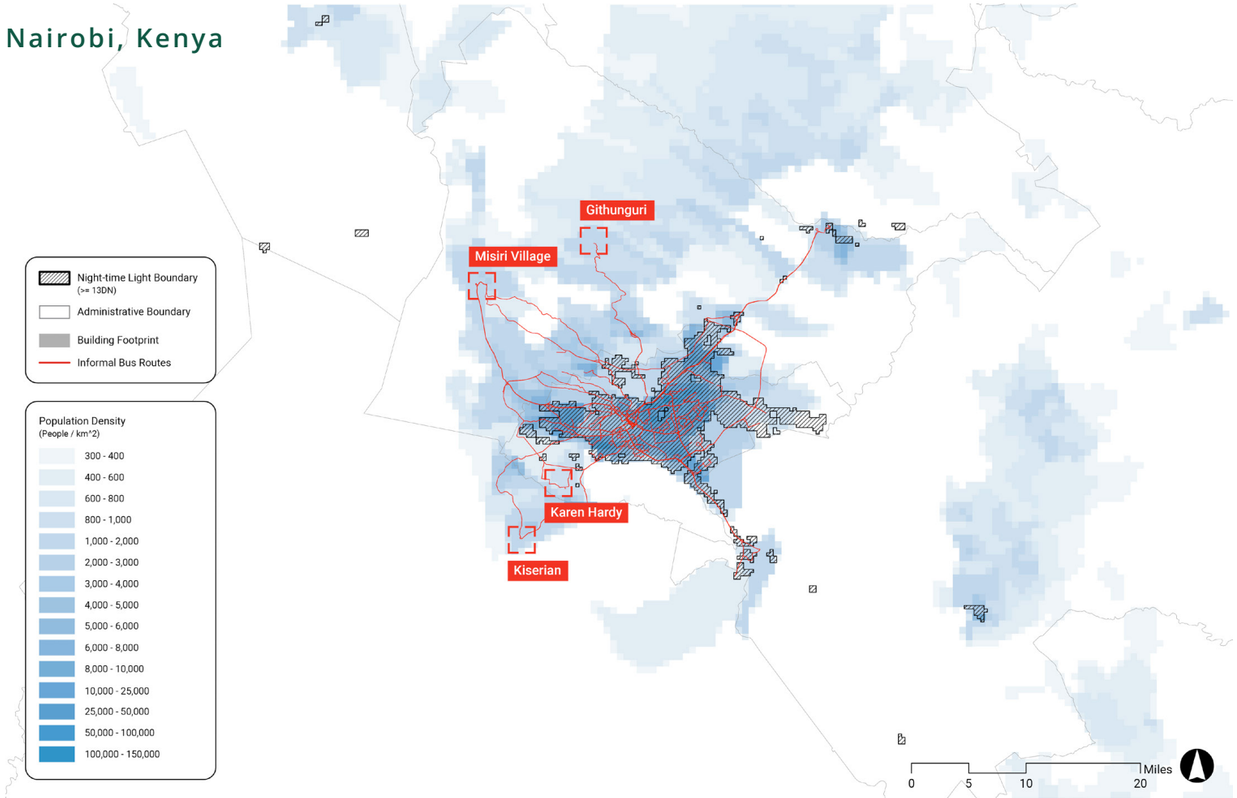
RESEARCH METHOD



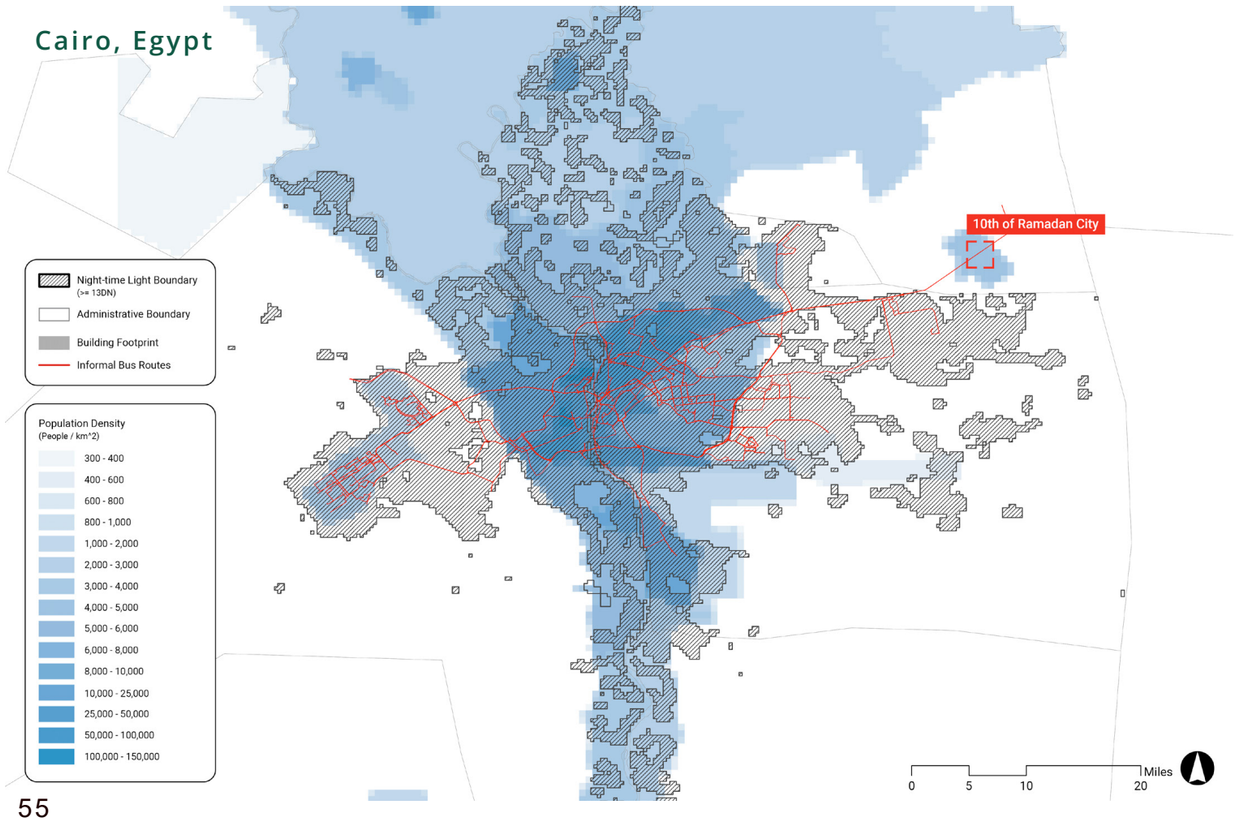
Accra, Ghana



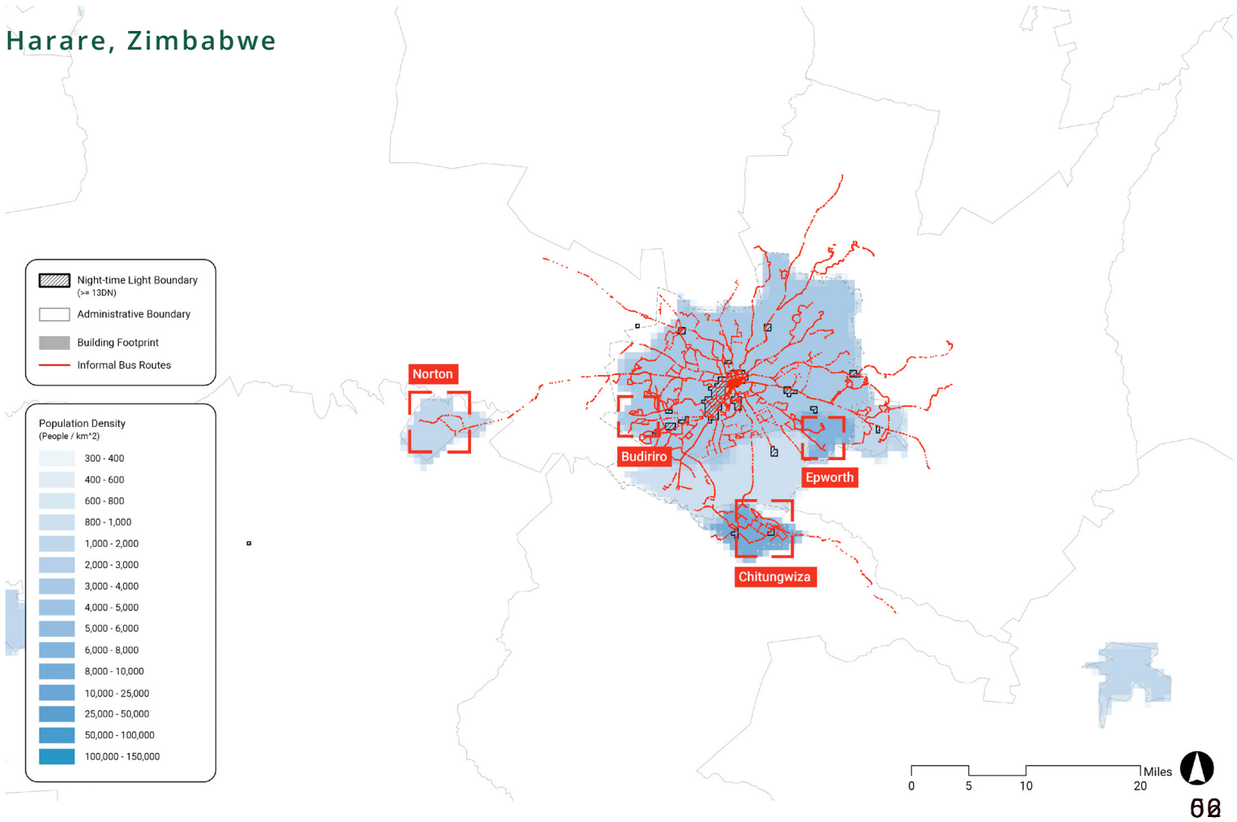
Nairobi, Kenya



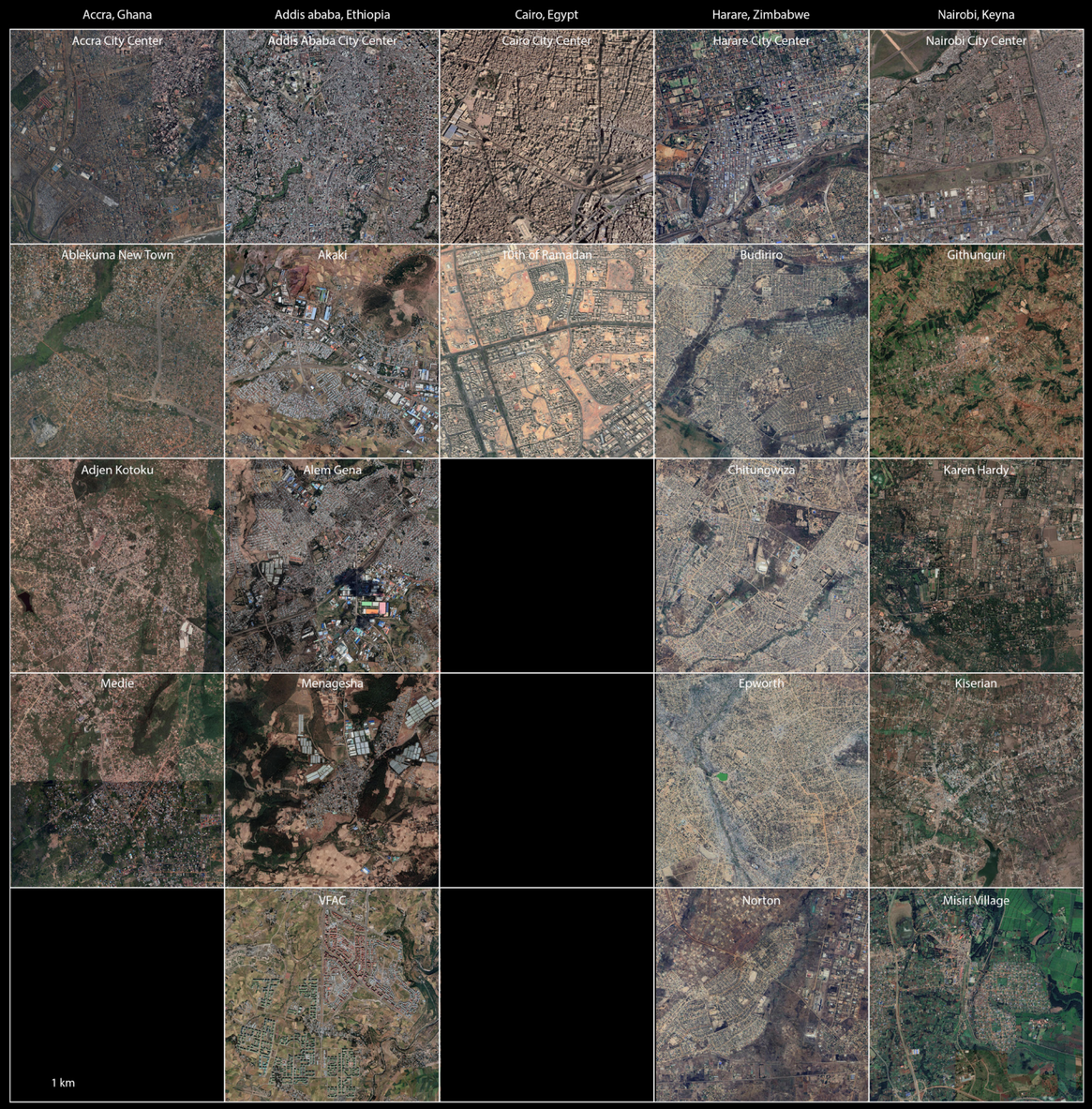
Cairo, Egypt



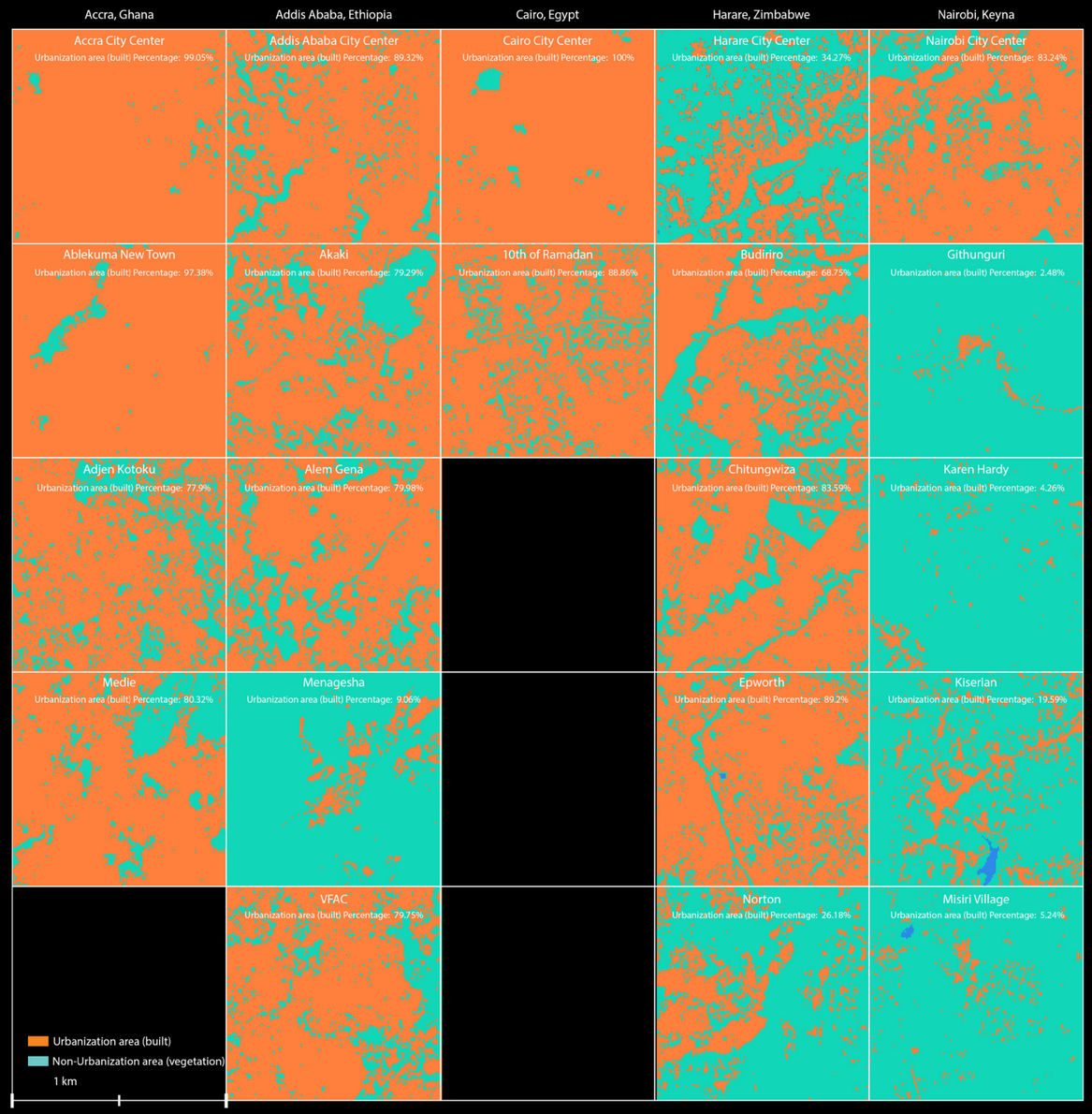
Harare, Zimbabwe



UNCOVERED INFORMAL BUS CITIES



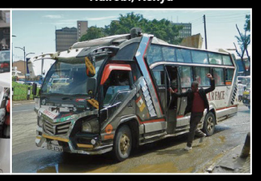
URBANIZATION AREA AND NON-URBANIZATION AREA



BUILDING MATERIALS

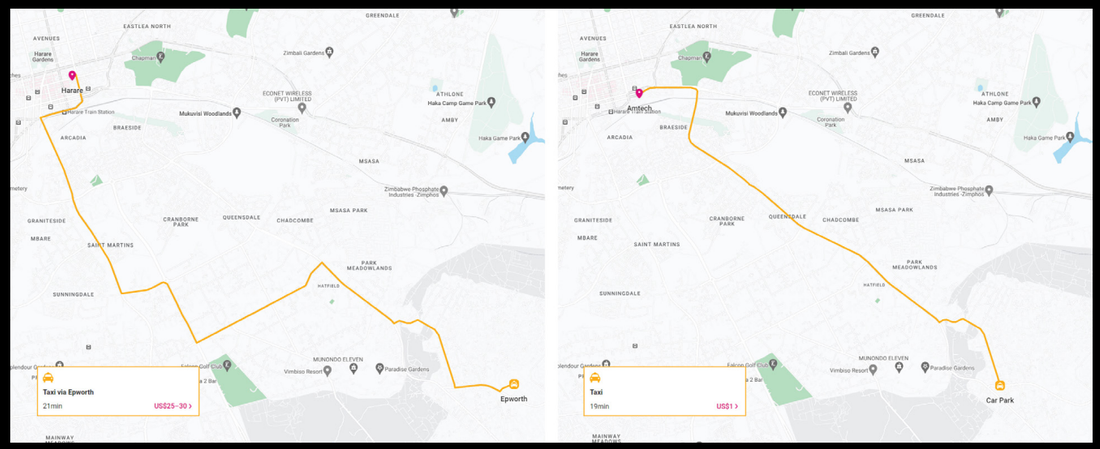
Accra, Ghana	Addis ababa, Ethiopia	Cairo, Egypt	Harare, Zimbabwe	Nairobi, Keyna
Accra City Center Earth Tone Percentage: 7.12%	Addis Ababa City Center Earth Tone Percentage: 11.52%	Cairo City Center Earth Tone Percentage: 33.34%	Harare City Center Earth Tone Percentage: 12.5%	Nairobi City Center Earth Tone Percentage: 7.22%
Ablekuma New Town Earth Tone Percentage: 17.17%	Akaki Earth Tone Percentage: 26.04%	10th of Ramadan Earth Tone Percentage: 27.18%	Budiriro Earth Tone Percentage: 16.33%	Githunguri Earth Tone Percentage: 5.76%
Adjen Kotoku Earth Tone Percentage: 22.1%	Alem Gena Earth Tone Percentage: 16.25%		Chitungwiza Earth Tone Percentage: 20.53%	Karen Hardy Earth Tone Percentage: 14.04%
Medie Earth Tone Percentage: 10.64%	Menagesha Earth Tone Percentage: 8.99%		Epworth Earth Tone Percentage: 22.99%	Kiserian Earth Tone Percentage: 19.89%
	VFAC Earth Tone Percentage: 24.97%		Norton Earth Tone Percentage: 23.99%	Misiri Village Earth Tone Percentage: 7.84%

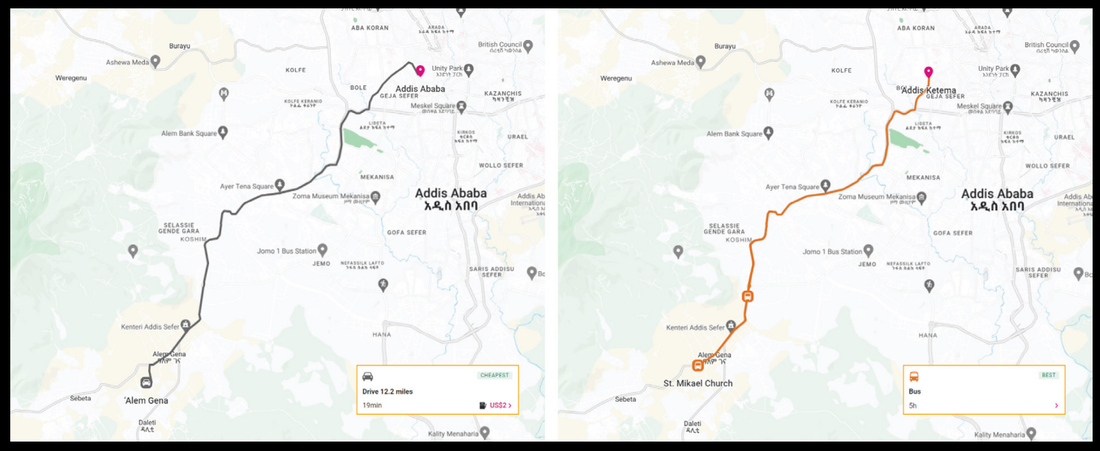
1 km

Accra, Ghana	Addis ababa, Ethiopia	Cairo, Egypt	Harare, Zimbabwe	Nairobi, Keyna
				
Trotro Informal Bus Usage Percentage: 70%	Minibus Taxi Informal Bus Usage Percentage: 73%	Microbus Informal Bus Usage Percentage: 52.3%	Mushikashika (Pirate Taxis) Informal Bus Usage Percentage: N/A	Matatus Informal Bus Usage Percentage: 58.7%

CITIZEN OCCUPATION AND COMMUTING TIME

Accra, Ghana ($498)	Addis ababa, Ethiopia ($580)	Cairo, Egypt ($574)	Harare, Zimbabwe ($583)	Nairobi, Keyna ($544)
Ablekuma New Town Bus: $ N/A, 1h 15 min Gas: $3-4, 17 min	Akaki Bus: $ N/A, 1h 45 min Gas: $2, 19 min	10th of Ramadan Taxi: $ 3-5	Budiriro Bus: $1, 27 min Taxi: $24-29, 18 min	Githunguri Bus: $ N/A, 1h 27 min Taxi: $60-75, 41 min
Adjen Kotoku Bus: $ N/A, 1h 38 min Gas: $5-7, 33 min	Alem Gena Bus: $N/A, 5h Gas: $2, 19 min		Chitungwiza Bus: $1, 24 min Taxi: $30-40, 23 min	Karen Hardy Bus: $ N/A, 48 min Taxi: $27-35, 20 min
Medie Bus: $ N/A, 1h 28 min Gas: $4-6, 27 min	Menagesha Bus: $ N/A, 45 min Gas: $2-3, 23 min		Epworth Bus: $1, 19 min Taxi: $25-30, 21 min	Kiserian Bus: $ N/A, 1h 18 min Taxi: $45-55, 34 min
	VFAC Bus: N/A Gas: $2, 25 min		Norton Bus: $2, 52 min Taxi: $50-60, 37 min	Misiri Village Bus: $ N/A, 1h 15 min Taxi: $60-75, 34 min





06 URBAN SENSORING

Privacy Forward

AVERY HALL, COLUMBIA UNIVERSITY

TEAM

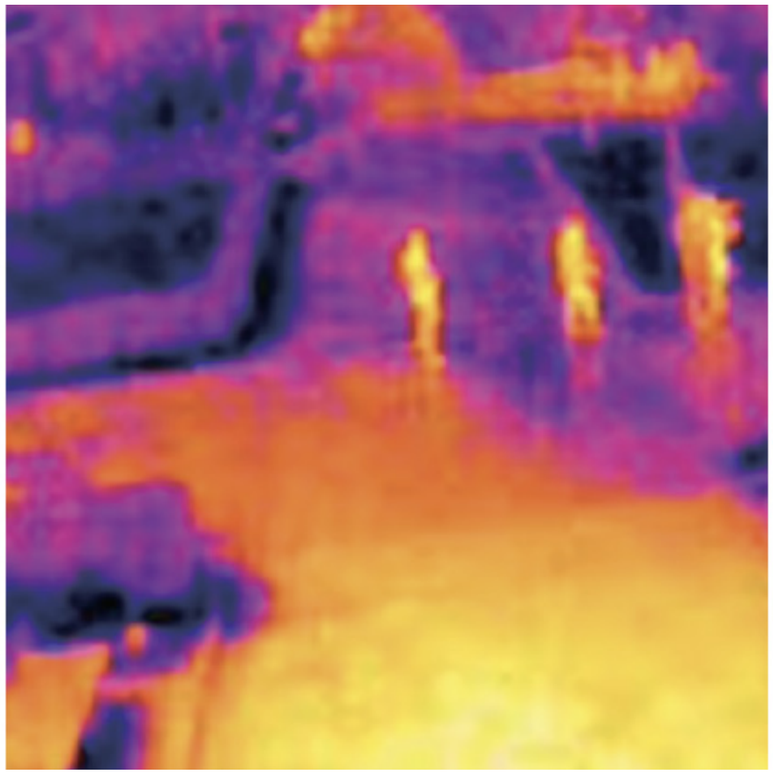
Chongyang Ren
George Verghese
Alan Ren

INSTRUCTORS

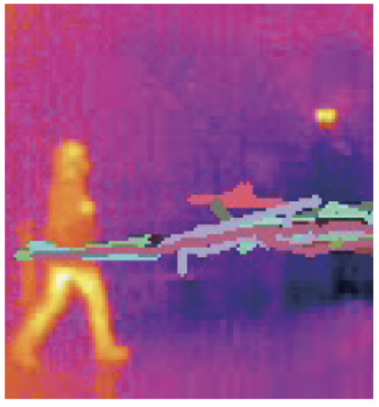
Anthony Vanky

KEY STATEMENT

Our team chose to test what it would require to develop and design a sensor with privac in mind. Setting out to solve this problem, we took up the interest in understanding what activities and flows in our public space are like. This process required understanding concepts of how much of data is needed, our end use cases and potential sensors.Through an iterative process we began to realise that privacy through software alone was not entirely perfect and it required a hardware level of intervention. Our goal was to implement a thermal sensor, built with an edge compute node that can quickly process and out binary data without ever requireing raw data storage. Using existing computer vision algorithms to create human tracks, we set out to understand and enumerate on our public spaces within Avery Hall. Through forms of expereimentation and analysis we tested and learnt of the costs and benefits of using such hardware in our public domain.



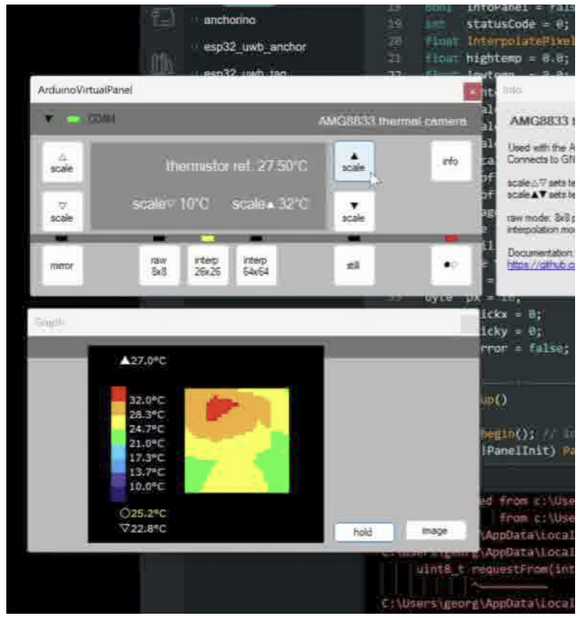
Choosing a site was an important challenege as there were needs to meet the constraints of the thermal cameras capability and the ability for the computer vision algorithm to detect objects and create meaningful tracks for us to analyse
Each site was compared to an RGB baseline tracking implementation to understand sensor and model performance



Avery Hall Eye Level

Avery Entrance Eye

Avery Level 100 Eye



Heatbodies is a system that utilizes an infrared camera and machine learning algorithms to track human movements and behaviors in real-time. The system is designed to ensure greater privacy for individuals being scanned as it utilizes a thermal camera that does not capture identifying features.

The project utilizes a range of technologies and software tools, including Python, OpenCV, TensorFlow, YOLOv5 with DeepSort, and the NVIDIA Jetson Nano edge computing platform. Python serves as the primary programming language, while OpenCV provides tools for image processing and computer vision tasks. TensorFlow is used for training the YOLOv5 object detection model and performing inference, and DeepSort is used for real-time object tracking.

The system operates by capturing thermal images of individuals and detecting human faces using the YOLOv5 object detection model. The DeepSort algorithm is then used to track individuals in real-time and analyze their movements and behaviors. The system generates a PNG image of the tracks, which can be used for further analysis and monitoring.

Privacy is a top priority for Heatbodies, and the use of a thermal camera ensures that individuals' identities are not captured. The camera only captures thermal data, which is converted into temperature measurements, and no identifying features are visible in the images. The system also deletes the raw data after processing to further ensure the privacy of individuals being scanned.

In summary, Heatbodies is a system that utilizes advanced technologies and software tools to track human movements and behaviors while ensuring their privacy. The system utilizes a thermal camera and machine learning algorithms to detect and track individuals, and it is designed to run on the NVIDIA Jetson Nano edge computing platform for optimized performance and energy efficiency. Heatbodies is a reliable and effective solution for monitoring and analyzing human movements and behaviors in public areas, workplaces, and other environments where accurate and private tracking is needed

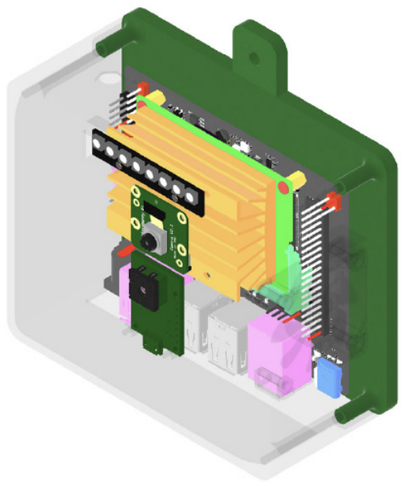
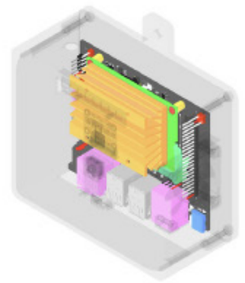
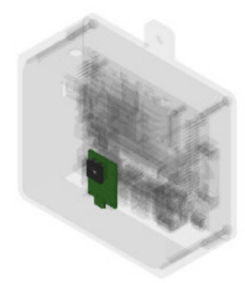


Image (bottom left): Model enclosure and harware parts laid out. Using online available STEP files to create a precision enclosure



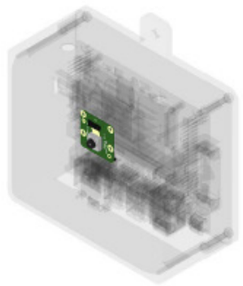
EDGE COMPUTE NODE

An Nvidia Jetson Nano 2GB was used to process and compute the imagery. Being a GPU enabled platform it performs well for computer vision



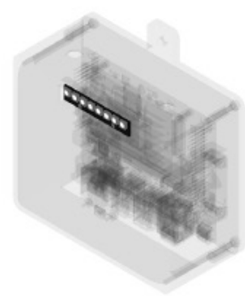
FLIR LEPTON 3

Flir is a thermal imaging camera with a resolution of 160x120px. It offers the ability to plug and play via usb port or pin outs



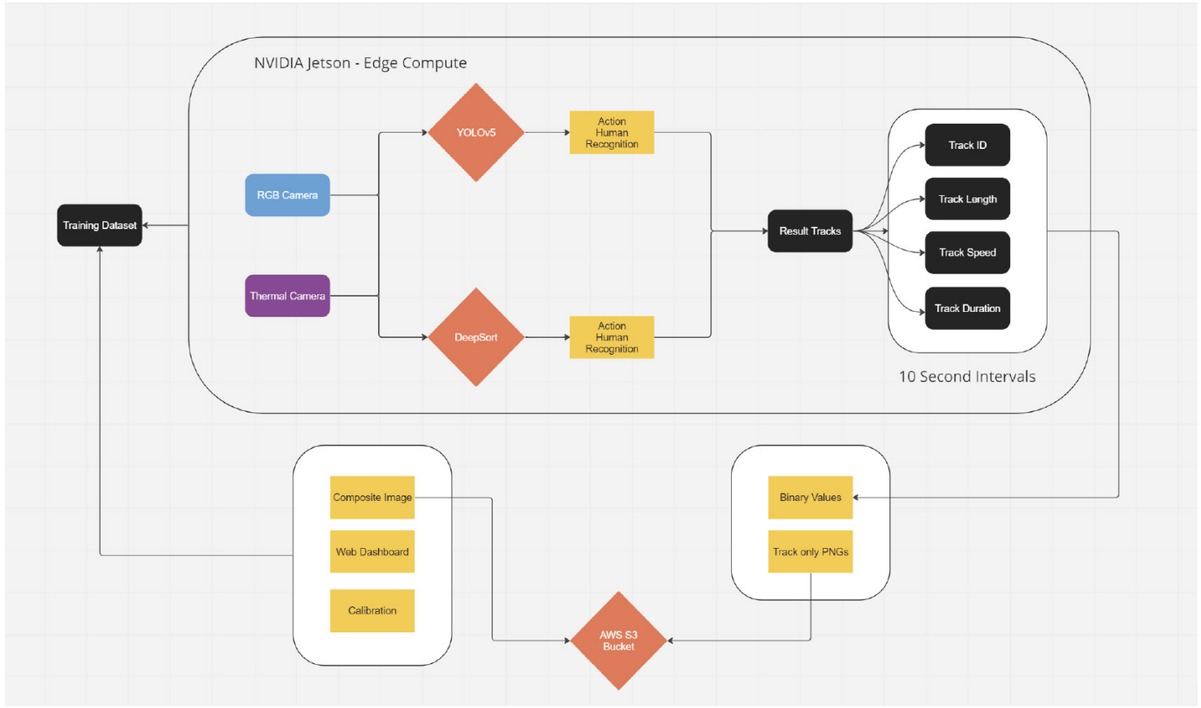
RASPBERRY PI CAM V2

A raspberry pi camera is a standard full HD RGB camera with a manual fixed focus setting. It connects over a CSI Ribbon cable for data.



ADAFRUIT AM3036 THERMAL CAM

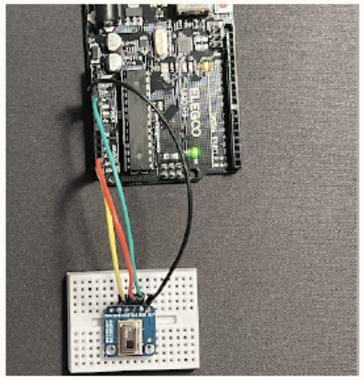
The adafruit camera is a low fidelity and cheap entry for an enthusiat thermal imagin camera and has a resolution of 48x72px



Heatbodies is a system that utilizes the NVIDIA Jetson Nano platform for real-time tracking of human movements and behaviors. The system captures thermal images of individuals using an infrared camera and then uses machine learning algorithms, such as YOLOv5 with DeepSort, to detect and track individuals in real-time. This process requires a significant amount of computing power, which is provided by the NVIDIA Jetson Nano edge computing platform.
The wrkflow for Heatbodies involves capturing thermal imag

es of individuals, detecting human faces and movements, and analyzing this data in real-time. The system generates a PNG image of the tracks, which can be used for further analysis and monitoring. To store and manage this data, Heatbodies can be integrated with an Amazon Web Services (AWS) bucket.
Capturing thermal images of individuals using an infrared camera.

Running the images through the machine learning algorithms, such as YOLOv5 with DeepSort, on the NVIDIA Jetson Nano platform to detect and track individuals in real-time.
Generating a PNG image of the tracks, which can be uploaded to an AWS bucket.
Storing and managing the PNG image data in the AWS bucket for further analysis and monitoring.



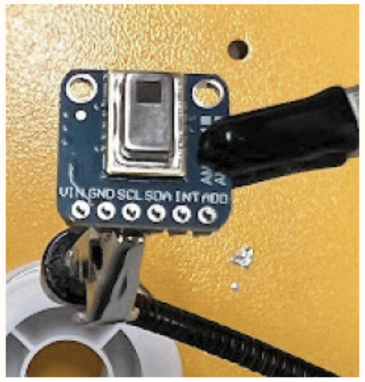


Image (right): Arduino IDE and virtual monitor to visual thermal value outputs from the sensor. The monitor software has built in interpolation methods